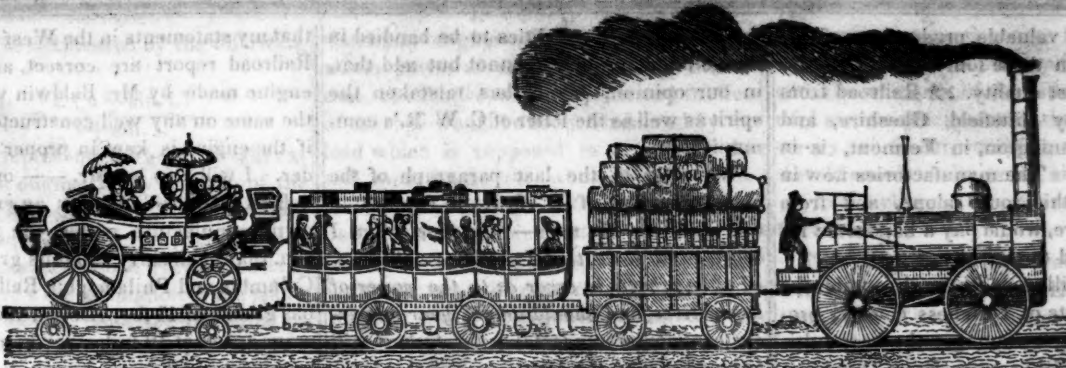

AMERICAN RAILROAD JOURNAL,

AND ADVOCATE OF INTERNAL IMPROVEMENTS.

PUBLISHED WEEKLY, AT NO. 132 NASSAU STREET, NEW-YORK, AT FIVE DOLLARS PER ANNUM, PAYABLE IN ADVANCE.

D. K MINOR, and GEORGE C. SCHAEFFER, } EDITORS AND PRORIETORS.] SATURDAY, JULY 9, 1836. [VOLUME V.—No. 27.

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AMERICAN RAILROAD JOURNAL.

NEW-YORK, JULY 9, 1836.

New Arrangement.—I take pleasure in announcing to the readers of my periodicals that I have taken as a partner, in the business pertaining to them, Mr. George C. Schaeffer, a gentleman of education and a practical engineer.

Mr. Schaeffer will hereafter have the principal charge of the editorial department of the Journal and Mechanics' Magazine—in the discharge of which duties he has for several months past taken an active part—and, as we have reason to believe, much to the satisfaction of cur readers and patrons.

With our united efforts we hope to render the periodicals worthy of a more extensive circulation.

D. K. Minor.

New-York, July 2nd, 1836.

The undersigned has the pleasure of announcing to his friends and to the readers of the Rail-Road Journal and Mechanics' Magazine, that he has become joint proprietor and editor with Mr. D. K. Minor, who has conducted these journals since their commencement.

In making this announcement the undersigned begs leave to waive the formality of making the usual protestations and claims to favor further than to state that the perseverance and zeal with which these journals have heretofore been conducted are guaranteed to them on the part of Mr. Minor—while he hopes by his own endeavors to add to their usefulness, his connexion with them for the last six months having already introduced him to the routine of business.

His family circumstances being such as to forbid the pursuit of the profession out of the city, will not prevent him from continuing his favorite studies to the interest and benefit of others.

Should he succeed his most earnest desires will be gratified.

George C. Schaeffer.

July 1st, 1836.

ENGINE.

A powerful *fire engine* has recently been exhibited in this city, by Mr. Thomas A. Chandler, of St. Lawrence county.

The peculiarities of this engine are, that it has four pumps or pistons, and two brakes, which may be worked together, or one at a time, as may be convenient. The piston rods are worked by *rack and pinions*, and against friction rollers, instead of with chains, as in the ordinary engine.

Mr. Chandler's Engine has been tried twice in this city—first in Broadway, opposite the City Hall, next in the corporation yard.

The first trial was made without any arrangement to man it, and therefore was worked by boys and such as were disposed to take hold of it; and from this and other causes, it did not work satisfactorily to its owner, who found, on taking it apart, that a quantity of *gravel had, by some means,* got into the machine, which probably prevented it from having a *fair* trial.

At the second trial, water was thrown 75 feet high with twelve men, and through 104 feet of hose, 122 feet *beyond the pipe*, with 16 men. In both instances a $\frac{7}{8}$ inch stream was thrown at the latter trial.

NEW YORK AND ALBANY RAILROAD.

The books of this important work, we are informed, will soon be opened. Its friends have had a topographical examination of the route, made the last month by Mr. J. D. Allen, an engineer of talents, and favorably known to the public on the Chenango canal, and several important works constructed by this State.

We understand there are several highly favorable routes : 40 miles, on a very direct line, may be graded to *nearly a perfect level,* and at a very moderate expense, from the abundance of the requisite materials to construct the road. The line of the Road, on any of the routes, will not exceed the distance now traversed by the steamboats from this city to Albany, (160 miles.) A locomotive will diminish the distance one-third *in time,* and if requisite, to 6 or 7 hours, with perfect safety to the passengers. Boston will be placed within 12 hours of us.

The country through which the line will probably pass, (which generally does not exceed 25 miles from the Hudson,) may be compared with the rich valley of the Mohawk, and with equal facilities for the construction of a Railroad, *without stationary power and on a very direct line.*

It is most singular that this road, so important to our citizens and state, has not earlier claimed their attention. It will connect us with the rich *agricultural* and *manufacturing* districts of New England, and the counties of Westchester, Putnam, Dutchess, &c.; Albany and Troy at *all seasons of the year*; and with the *Northern line* of Railroads now constructing, by Utica, to Buffalo, on the *West*. On the *East*, it is proposed to run branches (allowed by the amended charter) to several points in Connecticut, and also to connect with the great Boston Western Railroad, at Stockbridge, the centre of our best iron and marble dis-

tricts. These valuable productions of nature abound on three fourths of the entire rout, of the best quality. A Railroad from Stockbridge, by Pittsfield, Cheshire, and Adams, to Bennington, in Vermont, is in contemplation. The manufactories now in existence on this route alone, and from South Berkshire, would pay a handsome interest on a road to this city.

The road will pass through one of the most fertile parts of Dutchess county, pronounced by judges amongst the best cultivated districts of this state. From Dutchess, Putnam, and Westchester, we now draw largely for supplies to our markets, at a very heavy *expense of transportation to the consumer;* whilst large portions of their produce daily wanted on our tables, are permitted to go to waste on their hands, for want of a *direct* and *cheap* communication with this city at all seasons of the year. We could enumerate many articles, besides iron and marble; such as hay, the coarse grains, beef, poultry, vegetables, and regular supplies from the Dairy, in a cool and pure state, the want of all which, was severely felt last winter, and has yearly increased, with our daily growing population.

Within the period of twelve years from this date, we shall number 500,000 souls. We venture little in predicting, that then this road will be considered next in importance, to supply the necessaries and comforts of life, to the aqueduct from the Croton, to supply us with water.

LOCOMOTIVES ON INCLINED PLANES.

It is the fault of imperfect humanity that different impressions are conveyed by the same object to different persons. "Stubborn facts" are not to be gainsaid—yet the deductions from the facts must of course be as diverse as the dispositions of the observers. It is owing to this that disputes even in regard to the most certain and fixed branches of science will occur; and it is to this circumstance that such remarkably discordant views are entertained in regard to the capabilities of locomotives.

One day we receive a communication stating a certain performance, the certainty of the fact not being subject to a doubt.

Presently some one writes us, saying—I have no doubt that such and such statements are true; but I cannot see why; for they are in direct contradiction to established laws of mechanics—presuming that our data are correct.

Some time since we published a communication signed C. W. R., Montreal, 29th March, 1836, on the same subject. It was from a friend whose object we know to be—as he therein stated—to elicit truth.

We have since received the following letter in regard to the communication of C. W. R. We have omitted the name of the gentleman whom Mr. Campbell has discovered to be the author of that article, as we do not desire personalities to be bandied in our columns; And we cannot but add that, in our opinion, Mr. C. has mistaken the spirit as well as the letter of C. W. R.'s communication.

We refer to the last paragraph of the communication of C. W. R., in support of our opinion. He says—"*In conclusion, I beg leave to state, that I shall be much pleased to be proved in error as to the power of locomotives, and should any of your numerous contributors undertake the task, it will be received with the spirit in which this is offered—that of seeking the truth.*

"Yours, &c.,
"C. W. R."

We have but one remark more to make. In the first place, the statements of the "extraordinary performances" on the Baltimore and Ohio Road, &c., were not intended as samples of every day work; but to prove that locomotives could do what very many have asserted they cannot. In this matter C. W. R., and others taking the same ground, are in error.

Again: C. W. R. wishes, as well as others, to know what improvements have been made enabling locomotives to overcome greater obstacles than formerly, every thing else may grow and improve; but the laws of nature, and among them those of mechanics, have not that "India rubber" elasticity that man's laws possess, on the contrary are fixed and immutable. This being the case, these gentlemen, as they themselves say, would desire to have the reasons, in "black and white," for this unlooked for increase of power.

That reasons good and sufficient can be given we have no doubt. Meanwhile, we shall be much obliged to Mr. C. for such particulars as he may be plessed to send us, in regard to his engines.

The fact is, we are in a fair way to know much more about locomotion in this country than in England, if we do not already excel; and improvement coming in so rapidly, entirely astounds some people.

We also give a communication from a gentleman who, as we understand him, goes beyond C. W. R. in his calculations.

All we want to see is fair play, and information and truth will result.

Philadelphia, June 20, 1836.

To the Editor of the Railroad Journal:

SIR—My attention this morning was directed to a communication, in your Journal of the 30th April, signed "C. R. W.," and dated "Montreal, 29th March." It is well known to me that this communication is from Mr. ——, Engineer of the —— Railroad. I have not the honor of a personal acquaintance with Mr. ——, but as he has chosen to term some statements, in a former report of mine to the West Philadelphia Railroad Company, "*extravagant*," I submit for his acceptance the following proposition:—

I will bet Mr. —— one thousand dollars that my statements in the West Philadelphia Railroad report are correct, and that any engine made by Mr. Baldwin will perform the same on any well-constructed Railroad, if the engine is kept in proper running order. I will also bet Mr. —— one thousand dollars that I will turn out an engine of my own manufacture within the present season, that shall carry 200 tons gross over the Columbia and Philadelphia Railroad, which has grades of 45 feet rise per mile, at an average speed of 12 miles per hour: the train to consist of 50 cars.

I deem it proper also to remark, that Mr. Baldwin now constructs all his engines after one pattern, and that they are as nearly alike and of the same weight as they can possibly be made. About a year since, he constructed 4 or 5 engines with outside connexions, which differ slightly from some 20 or 30 others constructed by him. They are, however, of about the same power as those with inside connexions.

It is an easy matter for young men of little experience to call in question the statements of others, and to figure in a public newspaper. I have no time, and but little inclination, to enter into a paper discussion of this subject with any one. I have no objections, however, to give Mr. —— a practical lesson on the subject of motive power, and to back my assertions with my money.

I desire you to publish this letter, and hope to hear in a short time of Mr. ——'s acceptance of one or both of my propositions.

I am, Sir, very respectfully,
Your obedient servant,
H. R. CAMPBELL,
No. 351 North Sixth street, Phila.

To the Editor of the Railroad Journal.

BALTIMORE AND OHIO RAILROAD EXPERIMENT.

SIR—The Baltimore and Ohio Experiment reported in your Journal of the 12th March last, being frequently referred to as a proof of the facility with which steep grades on Railroads may be overcome by locomotive engines, it is to be feared is calculated to produce an injurious effect on the cause of internal improvement, by exciting hopes which cannot be realised, as the majority of persons interested in Railroads are unacquainted with the mathematical and mechanical principles necessary to enable them to form correct conclusions in such matters.

It is stated in the report that an engine weighing $8\frac{1}{2}$ tons drew a load of $20\frac{3}{4}$ tons, including its own weight, up a plane ascending 264 feet in a mile. This is certainly a very extraordinary performance, and shows the immense power of the engine employed. We shall make this more apparent by examining the matter a little in detail.

The relation between the load, friction, adhesion, inclination of plane and weight of

engine may be expressed by the following equation:—

$$W = \frac{E\,(a - \sin.\,i.)}{b + \sin.\,i.}$$

Where W represents the gross weight exclusive of the engine, E the weight of the engine, *a* the adhesion expressed in fractional parts of the weight, *b* the friction of the axles &c. expressed also in fractural parts of the weight and *i* the inclination of the plane. By substitution and reduction the equation in the case before us becomes $122 + 1.44\,b = a$. This equation may, it is evident, have several values; but, from the nature of the inquiry, they must be confined within certain limits. Thus, if *a* were equal to .122 the equation would become

$$1.44\,b = .122 - .122 = 0$$

whence *b* must be equal to nothing or the friction of the axles &c. be absolutely annihilated, this we know cannot be the case, it is therefore, certain that the adhesion of the wheels cannot be so small as .122. By the published reports of the B. & O. R. R. Co. we are informed that the friction of the carriages on their road has been reduced to the $\frac{1}{400}$ of the weight, we shall therefore, assume this for the value of *b* in our equation and shall consequently have .12566 for the corresponding value of *a*. By substituting these values of *a* and *b* in our primary equation and taking sin. i = o we shall have 427.2 tons for the value of W, that is an engine having sufficient adhesion to enable it to ascend a plane rising 264 feet in a mile with a load of $20\frac{3}{4}$ tons would have sufficient adhesion to drag 427.2 tons on a level road exclusive of the engine."

The mechanical power requisite to draw $20\frac{3}{4}$ tons up the plane is

$$20.75\ \sin.\,i. + \frac{20.75}{400} = 1.0885,$$

and $1.0885 \times 400 = 435.4$ is the load which the same power would draw on a level at the same rate of speed, and if we assume the load to be inversely as the speed half this weight or 217.8 tons at double the speed.

Let us now, in order to show the effective performance of locomotives on level and steep grades, suppose the road to be level to the foot of the plane in question, and the plane itself to be half a mile in length, the engine would, as we have just shown, drag a load of 217.8 tons on the level at the rate of from 10 to 12 miles per hour, and on the plane $20\frac{3}{4}$ tons at half that speed. The engine and tender, it appears by the report, weigh nearly 13 tons, whence $7\frac{3}{4}$ tons is the greatest effective load that can be drawn up the plane at one time, the engine must, therefore, ascend and descend the plane 28 times in order to get this load to the top, and as each ascent would, at the rate of 6 miles per hour, occupy 6 minutes, and each descent the same time, the whole load could not be got up the plane in less than $5\frac{1}{4}$ hours.

Instead of the locomotive, let us now suppose the load to be drawn up the plane by a stationary engine of the same power, the whole power of the engine would, in this case, be effective, as the weight and friction of the rope would be counterbalanced by the load which is supposed to draw out the tail rope, hence the whole load would be drawn up in 10 trips of 6 minutes each, or one hour. This calculation presents the matter in its true position, and shows the immense waste of power consequent upon working steep grades with locomotive engines; in the case before us, it is equivalent to raising $13 \times 28 = 364$ tons up a plane $\frac{1}{2}$ a mile in length, ascending 264 feet per mile.

The communication of your correspondent C. R. W., in the Journal of the 30th April, contains some very just remarks on the subject of steep grades and locomotives, but his calculations as to the power of the engines are very erroneous. The mere statement that an engine capable of drawing 200 tons on a level and 100 tons on a grade ascending 25 feet per mile, does not furnish sufficient data from which the traction, when the power is supplied by locomotives, can be estimated. The adhesion of the wheels forms an important element. The greatest weight an engine of $8\frac{1}{2}$ tons could draw up a plane ascending 25 feet per mile, by assuming $\frac{1}{211}$ for the traction, and $\frac{1}{12}$ of $\frac{4}{15} = \frac{1}{15}$ for the adhesion, as given by C. R. W., is

$$\frac{8.5 \times \frac{1}{15} - 8.5 \times \frac{25}{5280}}{\frac{1}{211} + \frac{25}{5280}} = 55.9 \text{ tons,}$$

and not 100 tons as stated by him. In order to enable the engine to ascend the plane with this load of 100 tons, the traction must be much less than $\frac{1}{211}$ of the weight, and the adhesion much greater than $\frac{1}{15}$, The ratio between these two quantities, as we have shown in a previous investigation, may be varied within certain limits without affecting the result.

If we assume the traction at $\frac{1}{400}$, the adhesion must be a little less than $\frac{1}{11}$, or accurately .0894, and the power necessary to draw 200 tons up the plane in question is,

$$\frac{100}{400} + \frac{25 \times 100}{5280} = 72,$$

and $.72 \times 400 = 280$ tons, the load which the same power would draw on a level. This investigation shows that there is no descrepancy in Mr. Seymour's statement, that an engine capable of drawing 100 tons on an ascent of 25 feet per mile, would draw 200 tons on a level.

Yours, &c.,
W. L.,
C. E.

Schenectady, N. Y., June 14, 1836.

☞ The article referring to *Little Falls*, which appeared in our last, was by accident put to press without having the proof properly corrected—It is therefore republished.

Little Falls.—This picturesque and thriving village is situated on both sides of the Mohawk river, 72 miles west of Albany, and 22 miles east of Utica. The great western canal passes through it, on the south side of the river, and is connected with the main part of the village by a beautiful stone aqueduct over the river, which serves as a feeder, receiving the water from the old canal on the north side, and affording to the village every convenience desired for business.

This beautiful village was, until within a few years, owned by an English gentleman,) Mr. Ellis, we believe,) and its *immense* water power was for many years, indeed almost since the revolutionary war, nearly useless, as the proprietor declined to sell, or even to give permanent leases, and the village of course made but slow progress in the march of improvement which has marked the course of many less favored places farther west.

Fortunately, however, here, as in many other places, a change has come over the aspect of things—a foreign proprietorship has given way to one of true American spirit. The title was about two years since transferred to a gentleman of this city, who viewed things as an American. He caused the property to be surveyed, streets and public squares to be laid out, and has contributed largely to the erection of churches, and has sold freely and at fair prices to those who desired to improve its advantages. Those who, like ourselves, recollect its appearance *twenty* years ago, and have witnessed its progress under the fostering care of its present proprietor, need no description of its present condition, or its delightful surrounding scenery—but to those who have not witnessed its beauties, a brief description may not be uninteresting.

The village of Little Falls is situated in a narrow defile, which appears to have been formed by the waters of the river in its passage from the lakes to the Hudson. On the west, and also on the east are the beautiful and fertile flats of the Mohawk; but on the north the village is hemmed in by hills, covered with forest, approaching in some places nearly to the water, with abrupt and almost precipitous acclivities; whilst in other places the village extends for half a mile or more from the main street. It is on the south side, however, that we behold the mountains in their majesty. The canal, which hugs the side of the precipice, and winds its way amongst the rocks, is about 30 feet above the river; and the summit of the hills are more than *three hundred feet*, and in some places almost perpendicular, above the canal. This was indeed a herculean task; and to others than Americans, an attempt to construct such a work would have been deemed almost chimerical. It was however, accomplished, and is now the admiration of the hundreds of thousands who annually pass on its waters.

The improvements of the place are progressing with spirit—its water power is estimated equal to 750,000 spindles and several sites with power have recently been sold.—

There are now in operation three furnaces, one turning shop, three paper mills, one machine shop, two saw mills, one flouring mill, one grist mill, one plaster mill, three tanneries, one distillery, two malting houses, three blacksmith shops, one axe and scyth factory and one carriage manufactory. A woollen factory, and two flouring mills with four runs of stones are to be erected the present season. This place being the centre of a rich agricultural country carries on a considerable trade with Albany and New-York. The item of cheese alone produced in Herkimer county, and shipped by its merchants, on the canal during the last season amounted to upwards of $350,000.

It is surprising to us who know and appreciate its advantrges, that a situation so eligible, so healthly and with such immense water power should have been until this period overlooked by this shrewd money making and speculating community. They will not longer be disregarded as proper attention is now directed to it; and the period is not distant when LITTE FALLS will boast of its numerous manufactories, its rapidly increasing, intelligent, and wealthy population and its flourishing schools. May it long continue to flourish; and its worthy proprietors, as well as its enterprizing population, reap a rich reward for their labor.

From the Newark Daily Advertiser.

The following communication comes from a responsible quarter. The writer has given much attention to the subject, and may properly be supposed to be entirely familiar with. His project looks well on paper at least:

NEW YORK AND BINGHAMPTON RAILROAD.

Few persons are aware of such a road, as the New-York and Binghampton Railroad. Indeed the Statute Book will be searched in vain for a law incorporating such a company, to construct a road with the above title; yet, I will endeavor to demonstrate, that there is such a road, if not by the above title, yet by a continuation of roads, authorised by *Pennsylvania and New Jersey*, extending from *Jersey City to Binghampton*, and, at this time, in progress of being made; and of its final completion there cannot be a doubt.

The following companies have been incorporated to construct this great work, to wit: the *Newark Railroad*,—road finished. The *Essex and Morris Railroad Company*. This road, which is connected with the Newark road, will probably be completed to Morristown the present season. The *Delaware and Hudson Railroad Company*, authorised to make a road from the *Delaware to the Hudson*, opposite New York, chartered for 99 years!!—This company will probably commence at *Morristown*, and terminate at *Milford*, on the Delaware, or at *Carpenter's Point*. Capt. Beach, the Engineer, is now engaged in surveying this route through Culver's Gap; the route is favorable

From Milford, a company has been incorporated by the State of Pennsylvania, with the title of the *Delaware and Lackawanna* Railroad Company. This road has been surveyed by Henry G. Sergeant Esq. an engineer of reputation, and a favorable report made, terminating on the Lackawanna at *Centerville*, in the very heart of the great Coal region. Another company has been incorporated as above, called the *Legget's Gap Railroad Company*, commencing at *Centerville*, on the Lackawanna, and terminating at the Susquehannah river near *Binghampton*. This road had been surveyed by Mr. Seymour, a gentleman now employed on the New York and Erie road; and his report is very satisfactory as to practicability of construction, &c.

Thus, Mr. Editor, I think I have shown that a great and important railroad is in progress from *New York* to *Binghampton*, and which may not improperly be called, "the *New York and Binghampton Railroad*," where it must necessarily connect with the New York and Erie road, as well as the Chenango Canal; circumstances of the highest interest.

A great road from the city of New York to the western part of that State, has long been a subject of deep interest to the Merchants of that city, as well as to the inhabitants along the whole line of this route through the three States. Here then is presented to the merchants of New York, what they have so long and anxiously desired,—"a direct and practicable route" to the western part of that State, and *in* actual progress of being made. The distance, too, is said to be less by nearly one hundred miles, than by the projected New York and Erie road. What an immense saving of time and money must result from this great difference of distance.

This road, too, passing through the center of the great coal region, is another circumstance of the greatest importance to the inhabitants of New York as well as New Jersey: this inexhaustible supply of coal is but about 120 miles from the city, by this road. A full supply of fuel and lumber could be poured into the city at all times, particularly the winter season when most wanted, and when supplies by Canal cease. What a relief will this be to the poor, as well as the rich; and let it be remembered that the Erie road shuns the coal country altogether.

Here then are the most powerful inducements to the merchants and capitalists of Newark and New York, to come out in aid of this great route, in which case the work would be speedily accomplished. The stock must be profitable.

SUSSEX.

We deem that the following information may be of information to our agricultural readers.

TEAZLES.

A trial took place at the term of the Supreme Court sitting at Greenfield, last week, at which a decision was made, and much information elicited, respecting an important branch of business connected with manufacturing. It is reported in the Greenfield Mercury.

Lester Tilden vs. Harvey Graves. The plaintiffs reside in Barre, Vt. and the defendants at Hartfield, and the action was on a contract entered into in September last, by which the defendants engaged to receive all the merchantable teazles, not exceeding fifteen hundred thousand, that the plaintiffs might purchase and deliver between that time and 1st of March last, and pay therefor four dollars and fifty cents a thousand—provided that none should be considered merchantable, which should not *measure* one inch and five-eighths in length.

It appeared that soon after the contract was entered into, teazles had fallen to about $2 per thousand, and the price, during the time limited, had fluctuated in the market from $1 75 to $3 00.

About the first of February the plaintiffs had delivered 800,000 under the contract, which were received and paid for by defendants, although there was then a controversy in relation to the measure. Two days before the expiration of the time limited in the contract, the plaintiffs again purchased of Bodman & Root of Williamsburg, a large quantity of teazles, which they took to Hartfield and offered to the defendants, who refused to receive them, unless the plaintiffs, in determining which of the lot were one inch and five-eighths in length, according to the contract, would measure from *within* the husk at the bottom, to the end of the pitch or core only, at the top. The plaintiffs accordingly notified the defendants that they should leave the teazles at a place which they should designate, which they did accordingly, at the same time having the quantity determined by Mr. Stearns of Williamsburg, who had adopted the rule to measure from *outside the husk at the bottom to the firm part of the bur at the top*, allowing all those as merchantable which came up to one inch and five-eighths according to that measure, and throwing in all others as not coming within the provisions of the contract. Measuring by this rule, Mr. Stearns made out the merchantable teazles in the disputed lot to be 642,000 in number.

Here was the *knob* of the case—and there was much testimony of manufacturers and dealers upon it. The rule adopted by Mr. Stearns was supported as the usual and true one by his testimony and that of Mr. Isaac Gere and Mr. Sanderson of Williamburg; while Mr. Buckland of Springfield, and Mr. De Witt of Oxford, testified to one more favorable to the purchaser, which would have thrown out, as unmerchantable under the contract, about one hundred thousand of those included in Stearns's measuerment.

There was also much curious inquiry on incidental points into the customs of the trade—the state of the market, &c.; and manufacturers from Leicester, Spencer, Oxford, Ware, Springfield, Williamsburg, Greenfield and Milbury, were examined upon the subject.

The jury found for the plaintiffs, and adopted the rule of Mr. Stearns as to the admeasurement. So let all teazle dealers remember that the proper way to measure teazles under a contract specifying the

length, is from outside the husk at the bottom to the top of the firm part of the fangs or burs. The Court had instructed the Jury that the property in the teazles had passed but was yet in the plaintiff's hands; and that if they found against the defendants, they would be bound to ascess damages to the amount of the difference between the market price or value at the time of the offer and refusal, and the price stipulated for in the contract. The jury had found these at 1505; but the parties, while the Jury were out, had agreed that upon the Juiy's finding the measure and so the quantity delivered, the defendants should take them at a stipulated price. Judgment was accordingly entered for the plaintiffs for $2753 damages, and ninety-five dollars costs. The plaintiffs, with Bodman and Root who were also interested with them, have probably made a profit of between two and three thousund dollars upon this contract, including the profits on the eight hundred thousand first delivered.

One of the particulars relative to the teazle business, which came out in the course of the evidence, was that there were three kinds of American teazles known in this market, none of them quite equal to the foreign teazles, and all differing from each other in value. The Connecticut or Wethersfield teazles are the best native ones, and are worth twenty-fiv: cents more by the thousand than the Williamburgh teazles which are raised in Williamsburgh, Hartfield, and vicinity. These last, again, are better than the Vermont teazles, which are raised principally in the Valley of the White River. One of the witnesses expressed the opinion, that the short summers of the north, promoting rapid growth, was the cause of the burs growing coarser and looser.

It is not a little singular says the Mercury, that no satisfactory artificial substitute for the teazle has ever been invented, though many have been tried. It is used, as our readers are aware, for raising a regular nap upon cloth; its long barbs being drawn over the cloth repeatedly till they have combed out all the knots and made it perfectly smooth. Should the barb of the teazle, when in use, become fixed in a knot, or encounter sufficient resistance, it yields or breaks without tearing or injuring the cloth—thus combining pliancy and stiffness to a degree which has not as yet been equalled by any mechanical contrivance for the same object. Both in England and in this country, it is emphatically termed a "casualty crop"—liable to a great variety of mischances, and of course exceedingly uncertain as to profit. We have been told that a large proportion of the teazle plants on the Connecticut river have perisehd during the past winter: if this is the case, the price will of course run up again.

The average price of teazles in England is stated in an English work, to have been for some years past about three dollars per thousand. They have varied, however, in that country, from two to ten dollars, and the extremes of fluctuation have been yet greater in this country.

From the American Gardener's Magazine.

NOTICE OF SOME OF THE EPIPHYTÆ, AND PARASITIC PLANTS OF THE U. STATES, WITH REMARKS ON THEIR PHYSIOLOGICAL CHARACTERS. BY JOHN LEWIS RUSSELL, PROF. BOT. ETC., TO THE MASS. HORT. SOC.

Although the tropics are peculiarly rich in these curious vegetables, which luxuriate in the dark and rapidly growing and decaying forests, yet even our more northern clime, can furnish a few no less interesting to the lover of science, though far less attractive to the artificial taste of the florist. Several genera may be found in the New England States, which, independent of their parasitic character are remarkable for the singularity of their form. In your summer ramble through the dense and damp woods, you may perchance meet with a curious cluster of brown, or yellowish, and extremely succulent, vegetables, covered with a pubescence, and instead of leaves, invested, with minute scales. Should your curiosity prompt you to stoop and examine the anomalous and fungous-looking body, you will discover, gentle reader! the curious and beautiful native epiphytic Orobanche, whose minute examination may repay your attention.—This genus forms the type of the natural order of Orobancheæ of Jussieu and of Lindley, and under this same order is its cogenus *Epiphagus* of Nuttall; which being a parasite on the roots of the beech (*Fagus*) has received from him its beautifully appropriate name One species, the "E americanus," is said to be found in Maine, but not in this vicinity.

Perhaps not far distant, and in the same ramble, you will notice the remarkable, and ivory Monotropa, in which nature seems to have forgotten her usual livery of green to invest one of her fairy and delicate production in a vesture of entire, unsullied purity. By a sort of desecration, it has received, in common language, the trival name of that instrument, which affords an exhilarating solace to many a devotee to the "fragrant weed." But however apt its resemblance or name, it may be a question, whether the simple taste which dictates the admiration of the flower, would not have proved as beneficial to the general happiness, as that more luxurious taste which invented both the name and its origin. Another cogenus, and you have Hypopithys, of which "H. lanuginosa" is by no means rare in the neighborhood of Boston, and is a distinct parasite, affixing its densely crowded stems to the roots of trees.

And have you not often observed the golden and glittering thread-like branches of the twining *Cuscuta*, climbing with an aspiring habit, not unlike its more gigantic, though not parasitic sister vegetables, up the slender stem of some delicate grass or plant herb; by the rapidity of its growth, and predatory disposition, draining the very vital energy from its supporter, till overclimbing and overreaching, it still progresses onward, over the topmost foilage, and lays hold of whatever next presents itself, till all are involved in inextricable confusion; and then, as if in triumph at the mischief it has occasioned, cover its leafless, voluble stems, with a mass of clustered flowers?

The first growth of the *Cuscuta* exhibits an anomaly of a vascular plant with perfect seeds, germinating without any cotyledon. A few other plants arranged under the exogenæ on account of their organization, are, in common with this, in fact, acotyledonous. The absence of cotyledons, has led to the theory of their presence in a consolidated, and consequently unfolded or undeveloped condition.

Throughout the Western States, you will find particularly upon the branches of the elm, the sempervirent mistletoe (*Viscum verticillatum*), whose parasitic and epiphytic character, and supposed virtues so early attracted notice. It is one of the few plants connected with the superstitions of a barbarous age, and from its rare occurrence on the oak, was estimated, when discovered in that situation, as peculiarly sacred. But like many other things that have nothing but antiquity to recommend them, its fictitious good qualities are overlooked, while its more prominent character of disfiguring the b anches of its otherwise graceful and elegant supporter, are only noticeable.

Farther south, in Florida, and on the sea coast of Georgia and Carolina, we meet with a species of the true and genuine epiphyte, in the "Epidendrum conopesum." This is the only representative in the U. States, of that curious genus. It has been found growing on the trunks of the noble "Magnolia grandiflora," both by Nuttall and Elliott, and by the latter, observed also on several species of oak.

In the last number of the American's Gardner's Magazine, for April, it is incautiously stated, in speaking of this plant, that it is "interesting as the only parasitical plant yet discovered in the U. States."—(p. 144, Vol. II.) It is true that it is the only epiphyte connected with the numerous congeners and co-species so common in other and tropical climates. That we have other parasitic epiphytes, has been already shown.

An almost innumerable family of less perfectly organized vegetable forms, which are to a certain extent parasitic, is composed of the Lichenes, Fungi, Hepaticæ, etc., but these deriving no necessary nutriment from the vegetables on which they are found, and growing also on the surface of rocks and of other bodies, are termed false parasites. None the less important are they, however, in the great economy of nature, which renders each minute particle of organized matter a great and necessary agent in her operations. Yours,

JOHN LEWIS RUSSELL.

South Hingham, April, 1836.

An Englishmun has just erected, on the river Theiss, in Hungary, a mill in the form of a colossal man—the head being the dwelling house, the eyes the windows, the nose the chimney, and the machinery in the body, driven by a stream of water in a canal, in the form of an immense bottle, emptying into his mouth.—[Daily Times.

From the Journal of the Franklin Institute.

REPORT ON THE USE OF THE HOT AIR BLAST IRON FURNACES AND FOUNDRIES. BY A. GUENYVEAU, ENGINEER AND PROFESSOR IN THE ROYAL SCHOOL OF MINES.

(Translated for this Journal, by Prof. A. D. Bache.)

Concluded from page 205.

II. *Application of the Hot Air Blast to Cupola Furnaces, to Smith's Forges, &c.*

The hot air blast appears to have been applied with great advantage, in England, in furnaces for remelting pig iron. The consumption of coke, per ton of iron, was reduced from 400 to 280 lbs., one ton of metal passing per hour. The blast was heated by an apparatus placed at the trunnel head. There are various advantages resulting from this application. The fusion of the metal takes place in about half the time required to melt it by the cold blast; it is thus less exposed to the injurious action of the blast, and while twice the quantity of iron can be melted in a given time, the quality of the material is better. It is further stated that the quality of the iron is improved by the melting, and that it is more easily cast, owing to its greater fluidity.

At Vienne, France, there are two cupola furnaces supplied with hot air. The apparatus is at the trunnel head, and consists of two-bell-shaped vessels, through the interstice between which the draught is forced. This form of apparatus is decidedly bad, the alternate expansion and contraction of the parts renders it leaky in a very short time. The efficacy of the hot air blast is felt, however, even at this furnace.

In applying the heating apparatus at the trunnel head of furnaces, for smelting lead, copper, &c., care must be taken to protect the pipes from the sulphurous and metallic vapors, which, issuing from the furnace, would destroy them very rapidly.

The fan, or rotary, blowing machine is used in several establishments at Paris, Rouen, &c. for supplying cupola furnaces with air. This though a simple means of applying power, does not seem to be an economical one. Even when great velocity is given to the fans, the force of the blast is inconsiderable, but by increasing the opening of the blast pipe, the quantity of air thrown in may be rendered very great. In one case at Rouen, by increasing the diameter of the tuyeres from 30 to 54 lines, the daily yield of the furnace was nearly doubled, and an economy of fuel (coke) of 20 per cent. resulted, the cold blast being used in both cases. At La Voulte the fan makes from 800 to 1000 revolutions per minute, and the pressure at the tuyere is only four-tenths of an inch of mercury. Three and a half to four inches is the ordinary pressure with other blowing machines. If the air were to be heated, this machine would be hardly applicable, as the friction in the tubes of the heating apparatus would tend materially to diminish the draught.

Unsuccessful attempts have been made both in England and France, to apply the hot air blast to bloomery furnaces.—The causes of failure are, however, not known.

A similar application to finery furnaces, using charcoal as fuel, has succeeded.—Mr. Combes states that at Lausen, (in Wirtemburg) the blast is heated by pipes below the earth of a finery furnace, and has its temperature raised to 390° Fah. With the cold air blast, they used 40 cubic feet of charcoal to produce 200 lbs. of bar iron, and the weekly yield of the furnace was 6,000 lbs. Now, with the hot air blast, they consume 30 cubic feet of charcoal to the two hundred pounds of iron, or about one part by weight of charcoal, to one of malleable iron; the weekly yield is from 7,200 to 7,800 lbs. On several occasions the consumption of charcoal per 200 lbs. of iron was as high as 36 cubic feet, which the workmen attributed to their using pig iron obtained by the hot air blast, which they considered more difficult to refine than that made with the cold blast.

This last conjecture is opposed to the experience at Konigsbronn, where they do not consider iron reduced by the hot air blast as difficult to refine. The economy of fuel by this method of refining, has been rather more than one-sixth, and the loss in rendering the iron malleable is diminished. This successful result is obtained by using the hot air blast in melting the metal, while it is decarbonized by the aid of the cold blast. This method of operating has been followed with success at the finery furnaces at Creusot and Decazeville.

I was present at some trials made upon a catalonia forge by an association of iron masters of the department of Ariege.—These were entirely unsuccessful. In the last of them the consumption of coal was not greater than with the cold blast, but the iron was of very inferior quality.

The hot air blast has been applied to the smith's forge with success. The iron was brought more rapidly to a welding heat, and the loss by oxidation was less than with the cold blast. There was no gain in the consumption of fuel. This method will probably be found useful in the working of steel, but no experiments have yet been made of a decisive character.

On the Use of Raw Coal, or of Wood, in High Furnaces, &c.

In order to produce a high temperature in a furnace, it is obviously necessary that the fuel should be consumed rapidly, and should not give off when heated, any vapors or incombustible gases, to carry off heat. The air thrown in by the draught contains four-fifths of its weight of nitrogen, which becoming heated causes a waste of fuel; if in addition to this vaporizable matters are present in the fuel, the loss of heat is greatly increased. Charcoal, coke, &c. make such hot fires because their volatile parts have been driven off by previous heating.

In high furnaces wood has been used to advantage, even in the smelting of iron, while it has failed in low ones. In the former the fuel descends slowly, and after having its temperature gradually raised, reaches the part of the furnace in which the blast is most operative. At this place the highest heat is to be found, and here the principal chemical changes take place. Thus in fact the fuel is gradually dried and carbonized before it reaches the place of greatest heat. If it were otherwise, the working of the furnace would be very unsatisfactory.

Experiment has proved the position just taken, however liable to objection it may seem on the score of the high heat which may be supposed, in every furnace, much above the tuyeres. It was found in the Hartz, by trial in a furnace of twenty feet in height, in which lead and copper ores were smelted, that the wood used as fuel came within six or eight inches of the tuyeres, without having been carbonized. The experiment was made by having small openings made at intervals in the stack, through which the progress of the operation could be examined. In this case the use of wood was abandoned, the furnaces being worked, as before, with charcoal.

A further proof of the same position may be drawn from the fact that raw coal, although substituted for coke, with advantage, in some high furnaces, has not been used in cupolas.

It is then absolutely necessary that the wood, or coal, should be converted into charcoal, or coke, before reaching the reducing part of the furnace. When this does not occur, and this is proved to be sometimes the case, the working of the furnace is unsatisfactory. The nature of the coal will produce different effects in the same kind of furnace. Thus at Alais a gradual deterioration in the working of the furnace resulted from the use of raw coal; at Creusot it was found necessary to mix the raw coal and coke in nearly equal proportions; in Scotland the hot air blast is required to enable them to use raw coal, while in Wales and at Decazeville they use raw coal with the cold air blast. The effect of the hot air blast is doubtless to facilitate the carbonization of the raw fuel.—To use wood for the smelting of iron, even in high furnaces, it has been found necessary to dry it before charging with it. This is true both in the Russian furnaces, and at Plons, in the latter of which the hot air blast is used, and the wood is mixed with charcoal. It should be observed further, that resinous woods, easily charred, have been the only ones hitherto tried.

This reasoning shows also why the more or less perfect roasting of an ore, the more or less moist state of the materials of the charge, the more or less complete carbonization of the wood or coal, produce such important effects, even in the largest furnaces. It is plain that the temperature just above the point when the ore is reduced is low, since coal, or wood, is not charred, and that to this we must look for the reason why it is so difficult to use these combustibles in the raw state.

M. Lampadius, of Freyburg, in his essay, "on the use of combustibles in their crude state,"* has shown how necessary it is to heat the wood, or turf, to a point near to that in which it begins to carbonize, before using it as fuel. He remarks that the cost of transporting wood or turf being, of

*Erdmann's Journal of Chem. and Technology, vol. XII. 1831.

course, much greater than the freight upon the charcoal from them, will prevent their use in many cases. Thus if it be supposed that there is a g in of twenty-five per cent in the quantity of charcoal, by using wood not carbonized, as was the case in the Russian furnaces, the balance would at Freyburg, be against the use of the raw material, on account of the cost of transportation. M. Lampadius concludes that when the material is at hand, or the cost of transportation low, uncarbonized wood may be used to advantage, in high furnaces, for smelting iron, if it has been duly dried; a result due to the heat given out in the combustion of the gases driven off from the wood, and to their reducing power.

The cause just assigned seems to me insufficient to explain the very great economy sometimes resulting from the use of the raw material; I consider the effect mainly due to the mode of carbonization, by which a much larger per centage of the carbonized fuel results than by the ordinary methods. The volatile parts of the fuel are driven off by the heated and incombustible gases passing through it, and there is no waste, by combustion. Being carbonized slowly, uniformly and without sensible waste, the greatest useful effect must result, and it is easily understood why a given weight of dry wood, or coal, may when thus circumstanced, yield a fourth, or even a half more charcoal, or coke, than it would by the ordinary method, and thus may be competent to reduce a fourth, or half more ore.

It must be admitted however, that this explanation does not account satisfactorily for the very great advantage found in the use of raw coal, in the high furnaces of Scotland, with the hot blast, and at Decazeville with the cold blast. At Decazeville, coal more than replaces an equal weight of coke. Thus one part by weight of coke was used for the fusion of 1.131 of mixed ore and flux, and now one part of coal is used to 1.675 of ore and flux. This coal would yield but .38 ($\frac{3}{8}$ths) of its weight of coke, and melt therefore but .43 of mixed ore and flux. The causes assigned by M. Lampadius, are therefore probably correct, being necessary in addition to that just examined, to explain the various effects.

On the Causes of the Efficacy of the Hot Air Blast.

It is plain that if cold materials are introduced within a furnace, they tend to lower its temperature, while their own is raised. If then the fuel and the blast be heated before they act chemically, to a temperature nearly equal to that of the part of the furnace at which the combination takes place, this heated portion will be increased in extent, its temperature will be higher than it would be under other circumstances, and the amount of heat, therefore, available in melting the ore, &c. will be greater. In smelting furnaces the fuel and ore are always thus heated. This is not the case, however, with the blast. In fact it has hitherto been considered an advantage to have the air as cold as possible, that it might contain more oxygen in a given bulk, and experience showed, in conformity with this view of the matter, that blast furnaces worked better in winter than in summer, and better at night than during the day.—The expansion of air by heat causing, under a given pressure, less oxygen to be thrown into the furnace, will produce a diminished consumption of fuel, and yield of metal. In wind furnaces, in reverberating furnaces, and generally in all where an ordinary draught is used, an increased temperature in the air diminishes the draught. It can only be increased by raising the temperature of the air in the furnace, by the use of a more freely burning fuel, by additional attention in firing, &c. The same difficulty occurs in the blast furnace, if the power of the blowing machine cannot be increased.

It so happens that at the very time the air is warmest, springs are lowest, and the condensation of steam most difficult, two facts which will explain why the working of furnaces, both as to quantity and quality, is better in winter than in summer. If the weight of air thrown into the furnace had been made the same in summer as in winter, by increasing the power of the blowing machine, and the area of the blast pipes, it is probable that the working would not have been worse, in the former season than in the latter.

An artificial heating of the blast should produce the same effects as that just alluded to, and it is by no means surprising that the efficacy of the hot blast has been doubted. It remains to be seen whence this efficacy results.

M. Dufrenoy* has, in his explanation of the advantages of the hot air blast, shown the difference between the quantities of heat introduced into the furnace with the hot and cold blasts, and in an assumed case has determined this difference to amount to about one-sixteenth of the heat evolved by the combustion of the fuel. Since less air is thrown into the furnace in using the hot blast, there is of course, on that account, less cooling effect to contend against than in the other case.

M. Clement Desormes concluded by calculating from data in an assumed case, that the temperature within the furnace is increased between 270° and 360° Fah. by the heated air blast; an increase which he considers adequate to explain all the observed effects.

These theories are far from settling entirely, the question in an economical point of view. They suppose indeed, that the consumption of fuel in heating the air may be equal to that saved in the reduction of the ore, which is by no means the case.

I propose therefore to classify the observed effects, and to point out their relative degrees of importance, and their connexion with each other and with established physical principles.

The effect of heating air being to diminish its density, and the consequences of this being decidedly bad when the air is but slightly heated, why should a further increase of temperature, even in a diminished pressure and density, produce so great advantages? The explanation is that the temperature of the air has a most important effect on the intensity of combustion, and there is no doubt a point at which this effect begins, and another beyond which it would hardly be sensible. Observation confirms th s explanation. Bars of iron are readily raised to a welding heat in a smith's forge, supplied with hot air, in half the time required by the cold blast, and as the same quantity of coal is consumed per day in both cases, the greater effect in the former can only result from an increased intensity of combustion.* In the most successful trials the air was heated to 370° and the diameter of the blast pipe not being changed, the quantity thrown in was actually diminished, and yet there was an increased consumption of fuel. It is then the temperature of the air, and not its density, which determines the intensity of the fire.

In the furnace, then, the fuel is burned to the greatest advantage; but, further, the heat thus produced is rendered most effective.—There can be no doubt that, in order to the regular working of the furnace, the different layers of the charge must descend regularly and horizontally. By the hot air process, the fuel is more completely converted into carbonic acid, than in the old process; more fuel is consumed in a given place, the temperature of which is, therefore, higher than in the former case; and this place of intense heat is more extended. As consequences, a greater mass of ore is reduced in a given time by the same weight of fuel, and more refractory ores can be reduced.

The charges descend more slowly, probably, because it requires more time to consume a large quantity of combustible in a given place, than to burn it through a considerable extent of the furnace. The air being completely deprived of its oxygen in the lower part of the furnace, cannot consume any of the combustible higher up. The charges have all moisture, or gaseous matter, completely driven off by the hot gasses passing through them, and arrive, duly heated, at the place where the most intense heating effects are produced. This diminished rate of descent is entirely consistent with an increased yield of metal, since the amount of ore in each charge is increased.

From the intense action referred to above, results a greater fluidity in the slag, a diminution in the quantity of flux, the possi-

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* Annales des Mines, vol. IV. This Journal, page 119, vol XV.

*Anthracite coal merely requires its temperature to be sufficiently raised to make it keep up the combustion by the heat which it gives out. Iron wire, to burn in oxygen, requires its temperatures to be first raised, and may be burned in chlorine if first fired by the combustion of copper wire. Iron filings, finely divided, burn in the air, and in the experiments of Mr. Tyler, a fire was made in a smith's forge, from iron turnings, by raising the temperature with fine turnings. At last the whole burning mass was iron, and a welding heat was produced in a bar thrust into it.—[Trans.]

ble use of more refractory ores, or an increased proportion of others in the charges, and the production of gray pig iron, by proportions in the charge in a furnace, which, before, would yield only white, or mottled, castings.

In conclusion, it may be remarked that some changes may probably be made with advantage in the forms of furnaces using the hot air blast. It is difficult to point them out, and their determination will require repeated trials, and with the precise ores and combustibles intended to be used in a particular case. I would suggest, however, especially where forged iron is to be made, enlarging the furnace at and above the boshes, diminishing, at the same time, the height of the whole furnace.—This latter change is understood to have already been made with advantage, in certain furnaces using charcoal as a fuel.

Effects of Drawing, Rolling, Annealing, &c., of the Metals.

In a paper on the ductility and malleability of certain metals, and on the variations of density which they undergo by different operations, M. Baudrimont developes the following interesting facts.

At a temperature rather above a cherry red, iron wire remained three months, surrounded by charcoal, without cementation taking place. A white heat, in five minutes, gave the properties of cast iron to a square bar of malleable iron, of four-tenths of an inch on a side.

Wires of copper, and of alloys of copper and zinc, are increased in diameter, and diminished in density, by annealing. The operation of rolling condenses the metals more than that of wire drawing. The density of iron and copper is greater, if the metals are heated before being passed through the rollers. The reverse is the case with alloys of copper and zinc. The density of the metals is greatest when drawn into very fine wires.

Wires may be increased in length in two ways, by a diminution in the area of their cross section, or by increasing the distances between their particles. When wires are lengthened in the manner last named, they return to their former length by annealing.

Hydrogen has an action on copper and silver, at high temperatures, which permanently separates their particles. On alloys of copper and zinc, and even of silver and copper, it has no such action.

Wires of different metals, which, after passing through the same hole in the wire drawing plate, have different diameters, acquire equal diameters by annealing.

The diameter of a wire increases, very slowly, by time, after passing through the wire drawing plate. Wires which have been bent, and then straightened, re-acquire a curvature.

Wires exposed to a high heat, lose a part of their tenacity. They require to be annealed in wire drawing, not to render them more tenacious, but to allow the particles to resume the positions from which they may again be displaced. The loss of tenacity is common to copper, iron, platinum, and the alloys of copper and zinc.

Brass wire approaches to iron in strength, while copper is inferior to it. Brass may be used instead of iron, where the latter would oxidate too rapidly.

The iron wires are given at strengths from 79,000 lbs. to the square inch to 127,600 lbs. The brass wires, from 78 to 87,000 lbs. to square inch. Copper, from 38 to 44,000 lbs. The diameters of the least and greatest wires were, iron, .014 inch, and .205 inch; brass, .070 and .267 inch; copper, .019 and .285 inch.

The finer wires bear greater weights, in proportion to their areas, than the coarser ones, because the particles of the former are compacted through the whole cross section, while those of the latter, for a certain depth only, are thus forced together.—[Ann. de Chim. et de Phys.]

A short Remark or two on what is commonly called Dry Rot, by Chas. Waterton, Esq.

Dry rot is a misnomer. This disease in timber ought to be designated a decomposition of wood by its own internal juices, which have become vitiated for want of a free circulation of air.

If you rear a piece of timber, newly cut down, in an upright position in the open air, it will last for ages. Put another piece of the same tree into a ship, or into a house, where there is no access to the fresh air, and ere long it will be decomposed.

But should you have painted the piece of wood which you placed in an upright position, it will not last long; because, the paint having stopped up its pores, the incarcerated juices have become vitiated, and have caused the wood to rot. Nine times in ten, wood is painted too soon. The upright unpainted posts, in the houses of our ancestors, though exposed to the heats of of summer, and the blasts of winter, have lasted for centuries; because the pores of the wood were not closed by any external application of tar or paint; and thus the juices had an opportunity of drying up gradually.

In 1827, on making some alterations in a passage, I put down and painted a new plinth, made of the best, and apparently, well-seasoned foreign deal. The stone wall was faced with wood and laths; and the plaster was so well worked to the plinth, that it might be said to have been air-tight. In about four months, a yellow fungus was perceived to ooze out between the bottom of the plinth and the flags; and on taking up the plinth, both it and the laths, and the ends of the upright pieces of wood to which the laths had been nailed, were found in as complete a state of decomposition as though they had been buried in a hot-bed. Part of these materials exhibited the appearance of what is usually called dry-rot; and part was still moist, with fungus on it, sending forth a very disagreeable odour. A new plinth was immediately put down; and holes, 1½ inches in diameter, at every yard, were bored through it. This admitted a free circulation of air; and to this day the wood is as sound and good as the day on which it was first put down. The same year I reared up, in the end of a neglected and notoriously damp barn, a lot of newly felled larch poles; and I placed another lot of larch poles against the wall on the outside of the same barn. These are now good and well seasoned: those within became tainted the first year, with what is called dry rot, and were used for fire-wood.

If, then, you admit a free circulation of air to the timber which is used in a house (no difficult matter) and abstain from painting that timber till it be perfectly seasoned, you will never suffer from what is called dry rot. And if the naval architect, by means of air-holes in the gunwale of a vessel (which might might be closed in bad weather), could admit a free circulation of air to the timbers; and if, he could, also, abstain, from painting, or doing with turpentine, &c., the outer parts of the vessel, till the wood had become sufficiently seasoned, he would not have to complain of dry rot. I am of opinion, that if a vessel were to make three or four voyages before it is painted, or done with turpentine, &c., its outer wood would suffer much less from the influence of the weather, than it usually suffers from its own internal juices, which cannot get vent, on account of artificial applications to the pores. But still the timber would be subject to the depredation of the insect. To prevent this effectually, Mr. Kayan's process must absolutely be adopted; and it must also be adopted to secure wood from what is called the dry rot, in places where a free circulation of air cannot be introduced. I consider Mr. Kyan's process perfectly unexceptionable.—The long arrows which the Indians use in Guiana are very subject to be eaten by the worm. In 1812, I applied the solution of corrosive sublimate to a large quantity of these arrows. At this hour they are perfectly sound, and show no appearance that the worm has ever tried to feed upon them.

I have penned down these transient remarks by way of preface to others, which I may possibly write, at some future time, on decay in living trees.—[Loudon's Archiect. Mag.]

New Spirit Lamp.—A new and convenient spirit lamp, with an eolipyle having a vertical jet, is described by M. Pelletan, the invention of M. Breuzin, of Paris.—The entire apparatus is placed on a neat tripod stand, arranged for holding the vessel to be heated. The wick of the lamp is hollow, and is raised or depressed by a screw and rack. Above the lamp is an eolipyle of cylindrical shape, through the middle of which the flame of the lamp passes. The vessel to be heated being placed above the eolipyle, retains the full effect of the flame of the lamp. The jet pipe from the eolipyle passes downwards, and by a bend is introduced into the axis of the cylindrical wick of the lamp. The alcohol flame is thus entirely vertical, and the apparatus is much more convenient than the common eolipyle where the jet is horizontal. By using vessels properly arranged to economise heat, a pint of water may be boiled in five minutes, and at a cost

of less than half a cent (at Paris). In a common coffee biggin, the same quantity of water may be boiled for about a cent.—[Jour. Connaiss. Us. et Prat.]

Application of Tannate of Gelatin to taking Casts from Medals, &c.—This substance is obtained by adding a decoction of gall nuts, sumac, oak bark, or other substance containing tannin, to a solution of glue or isinglass, in water. It is fibrous and nearly insoluble. When exposed to the air in thin layers, it hardens. When moist, it is elastic.

The substance which was found to give the best mixture for casts, was finely pulverized slate. Silica, emery, &c. give pastes which harden, and may be used for razor straps.

In making casts of the mixture of tannate of gelatin and pulverized slate, it must be left for a certain time in the mould, in order to preserve the impression. If, however, it is allowed to remain there too long, it adheres strongly. The only difficulty in the application is to ascertain the precise time required for due hardening.

This substance may replace bronze in ornaments, papier mache, card work, &c. —[Ibid.]

Analysis of two varieties of Bronze.—These specimens were analyzed by M. Berthier. The first was intended for the manufacture of cannon, but proved of bad quality; its composition was ascertained to avoid the same proportions in other mixtures. It consisted in 100 parts, of copper 83.8, tin 15.7, lead 0.5.

The bronze used at Paris for the striking parts of clocks, was found to be composed in 100 parts, of 71 to 72 of copper, 26.56 to 27 of tin, 1.44 to 2 of iron.—[Ann. des Mines, vol. VII.]

Sheathing of Ships with Bronze.—The sheathing of this metal has been found by experiment, to lose but half the weight, in a given time, which copper would have lost. The composition used for making sheet bronze is 91 of copper and 9 of tin. —[Ibid.]

Durability of Acacia Wood.—It was found that in the mining galleries at Carmaux, (France) the oak timber used to support the sides and top of the galleries, decayed very rapidly, being effected by the dry rot. A comparative experiment was made with acacia wood, from which it resulted that the latter wood is much more durable than the former, when exposed in such situation. Oak timber decayed in three months, while the acacia was unacted upon, except at the sap-wood surface, four years.

The lateral strength of this wood is about equal to that of Norway pine.—[Ann. des Mines, vol. VII.]

From the American Journal of Science and Arts.

ACCOUNT OF AN AURORA BOREALIS, WITH A NOTICE OF A SOLAR PHENOMENON; BY CAPT. R. H. BONNYCASTLE, R. EN., TORONTO, UP. CANADA.

I. *Aurora Borealis.*

Having witnessed from the days of my boyhood, the splendid phenomena of the Boreal Aurora, in almost all the latitutudes under which it is usually seen, as far north as to have observed the sun at midnight, and particularly during a long sojourn in Shetland, where the people imagine, from its extremely swift changes and inexpressible vividness, that they can actually hear its rushings, I have ever been anxious to seize all opportunities of endeavoring to catch its Protean forms, and to describe them, in hopes that by exciting attention to facts concerning this wonder of northern skies, science might be more attentive to its appearances, and that at length it might become a portion of the duty of meteorologists to detail in their columns, all circumstances concerning it, which they might observe.

The Aurora in the high northern latitudes, when at its extreme, is almost dazzling, and the quickness of its motions approaches that of lightning. In other situations, it has also been observed to assume irised colors. But although all these combined are eminently wonderful, and strike the spectator with profound admiration and awe, yet perhaps the regions of Upper Canada, bordering on Lake Ontario,* exhibit, though not so splendid and varied a display of this mystery, yet one equally, or perhaps more, interesting to the philosopher. I have now witnessed the Aurora at Kingston for upwards of four years, and in a former volume of the Transactions, have described a magnificent scene, which occurred there two years ago.

During the winter months, on Lake Ontario, the Aurora may be said to be almost constant companion of the dark and cheerless nights, and it occasionally presents itself at all other times of the year, nor is it in winter a mere display of a glorious phenomenon, the utility of which has not yet been exemplified by science, for it sheds a continued and pleasing light, which resembles that of the crepuscular. The light does not, as in Europe, emanate from the vivid streamers which dance over the starry floor of the heavens, in ever changing and inexplicable mazes, but proceeds from the northern horizon, over which a pale, luminous, low, and depressed arch, embracing an extent of from sixty to ninety degrees, is commonly thrown. This arch is generally luminous in its whole body, not on the rim or verge only, which fades away into ethereal space, but from its superior circumference to the chord formed by the horizon itself, and varies in its elevation, from ten to fifteen and twenty degrees. Wherever it embraces stars, these luminaries are either veiled or dimly seen, being strongly contrasted on a fine star light night, with their fellow orbs of the southern heavens, which appear to shine out with double brilliancy.

Within the space comprehended by this arch of light, continual changes are operating, if the Aurora assumes a splendid shape. Dark volumes of vapor, not like clouds, but blackening in a moment, rise and fall, whenever a ray or an interior arc begins to form, and it is remarkable, that this darkness usually accompanies the commencement of every change in the scene, thereby increasing the majesty and beauty, as well as the brilliancy of the spectacle.

But it is impossible for any pen adequately to describe a phenomenon, which is continually presented in these regions, and it is with diffidence that I continue a task imposed on myself. It will, therefore, be more satisfactory to detail the circumstances attending a very recent repetition of one of the most beautiful of those which have been seen at Kingston this winter, nearly the whole of which I saw, and whatever escaped me was related by a very accurate observer.

On the evening of the 11th of December, 1835, the sky, after the sun had sunk, was dark and gloomy, and although there were but few clouds visible, and the stars were rapidly brightening, a change of weather was apparent. Snow had fallen, for the first time, on Wednesday, the 8th, after a short space of great cold, to the depth of about five inches, and the thermometer had sunk afterwards to 16°, at which it stood on Monday, the 13th. On Tuesday, it rose to 30°, and rain in abundance falling, removed the snow entirely. It was exactly midway between the extreme cold and the thaw, that the Aurora took place, the thermometer at the time standing at about 26°, and the wind, a gentle breeze from the north west. The barometer stood at 29.9, at 9 P. M., at an elevation of forty feet above the lake, which is two hundred and nineteen feet above the level of the sea.*

Its first appearance, after darkness had completely set in, was by the luminous arch above mentioned assuming its wonted place. From this arch, in the north, arose almost incessant streamers of bright white light, which shot upwards to the zenith, and streaked the dark sky with their silvery lines.

Once a mass of light suddenly opened in the zenith, and from it darted out innumerable pencils of bright rays, overspreading the dark vault of heaven with their glories, and seeming for a moment to illuminate the sky with a star which its vast space was scarcely capable of containing.

Again, rods of white light would dart forth from the northern horizon, and one single one, in particular, spanned the whole arch of heaven, touching the southern horizon over the great lake.

This play of the Aurora continued from seven till near nine, and was most brilliant and magnificent about nine, when it assumed another and not less singular attitude, of which the following is a faint attempt to delineate.

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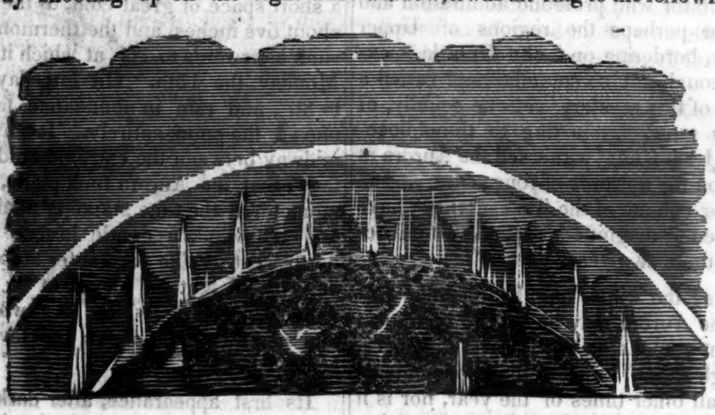
* Not having observed it elsewhere in Canada, I speak only of locality as a personal observer.

* The barometrical observations were made at the Hospital on Point Henry, by a very accurate observer. On the 10th December, it indicated, at 9 A. M. 29.5, at 9 P. M. 29.7; on the 11th, at 9 A. M. 29.8, at 9 P. M. 29.9; on the 12th, at 9 A. M. 30.1, at 9 P. M. 30.1.

These arches are not so flat as they should be, but the space is insufficient to show them exactly. The lower one was usually the boundary of a very dark black, changing mass; between the lower arch and the second, the space was not so dark; and between the second and third, or upper arch, it was still lighter, excepting where the coruscations shot upwards out of the second arch, and there it was very dark. The second arch was incomplete.

The ray shooting up on the right was brilliant in the extreme. Stars were partially visible above the third arch, but the bright ones in Ursa Major, on the left, had lost all their splendor, and the constellation could just be traced. The obscuration of the heavenly bodies reached almost to the zenith, above the centre of the arch, and was less over the extremeties.

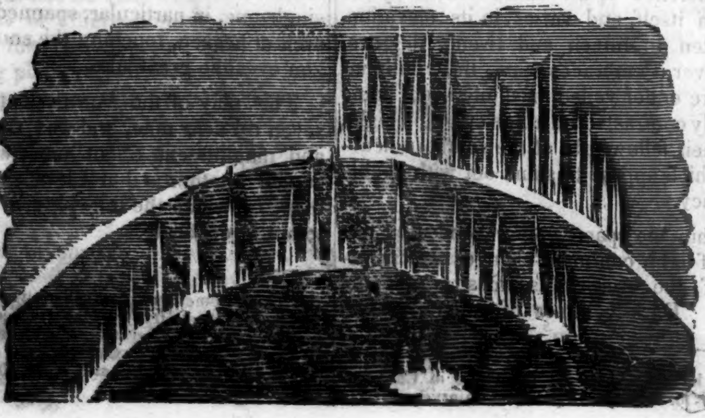
The first appearance lasted long enough for me to go into another part of the house and make a hasty sketch; or my return to the window, it was altering to the following form.



The lower arch had somewhat heightened and become darker, with here and there spots of light in it, whilst from its circumference shot out brilliant rays and pencils of light. The second arch had altogether disappeared, but the upper one held its wonted place. It must be observed, that the upper arch was always paler, and more indistinct in its outline than the others. Faint stars now appeared through the darkish vapor, between the two bands or arches of light, and the lower band was indistinct, excepting to the left of its central space, where it was vividly depicted and extremely well defined, by a sharp

None of the pencils or rays, which soth out of either of the changes of the Aurora, were so quick or so intensely vivid in their action or light, as those seen in the more northern regions, nor were they colored; but they were always accompanied by the black vapory shroud, which hid every thing else from view, and added greatly to the lustre of their exodus from the horizon.

Having made the foregoing sketch, I again returned to view the Aurora, which had somewhat changed its appearance. band of bright light, cut off, both above and below, by very black vapory masses. This second appearance lasted, also, long enough to enable me to make a hasty sketch of it.



Both arcs or belts were now less distinct, the lower one almost obliterated, but still its place was well marked by the arch of vapor below, which was darker than ever. Three large spots of intense light now displayed themselves, one on the horizontal chord, and one an each side of the lower arch, whilst this lower zone shot out innumerable pencils and floods of light fiom its dark nucleus, the upper zcne also darting forth long lines of brilliant rays; all these rays from both hands, moving in a very statelymarch or progression from east to west.

Towards the southern and western portions of the heavens, all was clear blue-black starlight, Orion being particularly brilliant; the north was as if overspread with a thin veil, through which the stars were barely visible.

I watched these alterations of the phenomenon until after ten; and the last I observed presented this form; after which the arches became less distinct, and eventually, with the exception of the great arch, passed away.

In this fourth change the Aurora, it will be observed, resumed its three arches, but they were no longer concentric, the third being broken on the right into a portion of a fourth. Between the second and third the darkness was the darkness of blackness, whilst the third arch was light itself; but the lower arches were not so bright, and the lower nucleus was only darkish, which was contrary to every state that it had presented, under any former observations for several years.

The constant arch of the Aurora of the Lakes has, I believe, never been noticed in any scientific publication, as is well worthy the attention of the learned. Whether it is created by a peculiar locality of the matter, of which the substance of the Aurora is composed, or whether the Aurora itself as

the magnetic influence, has a peculiar pole from whence its effluences emanate, can scarcely be, at present, determined; but it is at all events highly singular, that in a latitude so low as 44°, the Aurora should assume forms, unknown in the higher northern regions where its powers were hitherto supposed to have developed themselves in the highest possible state.

Not having been very well when this singular scene occurred, I did not take all that notice of it which it deserved. I trust I shall be able during the winter to note the atmospheric phenomena which accompany it, more particularly, as well as to give more detailed accounts, and more perfect drawings.

II. *Solar Phenomenon.*

Immediately previous to the alteration of the weather at Kingston on Lake Ontario, after an unusual duration of severe frost, and about the middle of March, at near four o'clock in the afternoon of Sunday, I observed a singular species of halo or rainbow.

The day was mild, and there was scarcely any wind, and no rain, but the face of the sky was overclouded, and the sun appeared as it does through a slight fog.

Around the luminary, at a radial distance of perhaps twenty degrees, there was a dark halo of the usual defined character and appearance; and circling this halo in various places, a rainbow was visible. This rainbow was brightest in the eastern and western parts of the halo, where it assumed that peculiar appearance which seafaring men call weather dogs, and which are of very frequent occurrence in the northern division of the Atlantic ocean.

It was evident from the dull whitish light, that was diffused about those portions of the circumference of the halo on which the prismatic colors were not perfectly defined, that, in some situations, an observer might witness the singularly interesting spectacle of a circum-solar rainbow, in which the prismatic colors formed a complete circle, concentric with the sun.

In the course of the winter season, during changes of the weather from frost to a thaw, I have frequently observed a small portion of a vertical arch of the above description, although the sun was hardly visible. Usually these occurrences have taken place when the sun has been at the same elevation, as in the instance here described. They have always happened when there was no rain.

I am unable to say whether the appearances might not be created by reflection from the brilliant surface of such a vast body of ice, unincumbered by snow, as has been presented by Lake Ontario during the last winter, as it is difficult to account for the formation of a rainbow of so small a diameter on the usual principles, since the sun at the time was forty degrees above the horizon.

I have used the word rainbow in the above description, although it is not a correct one, as there were no appearances of rain during the presence of the phenomenon, although it is true there was a slight mist or fog.

Since writing the above, I have seen an almost complete circum-solar rainbow which appeared at Toronto, (U. C.) July, 1834, at 7 in the morning.

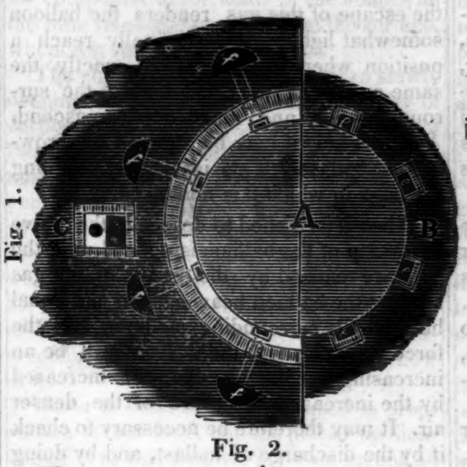
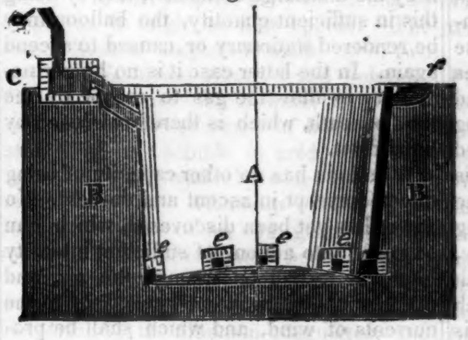
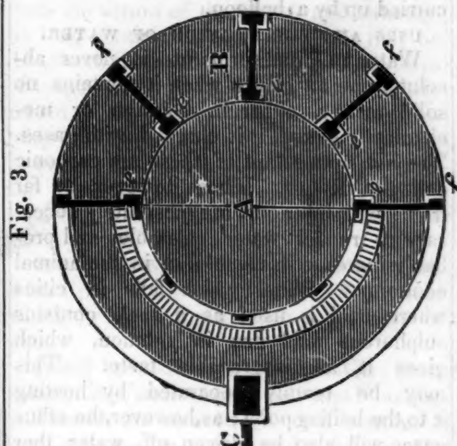
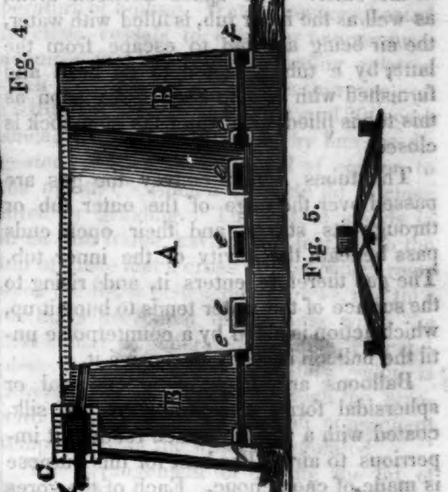
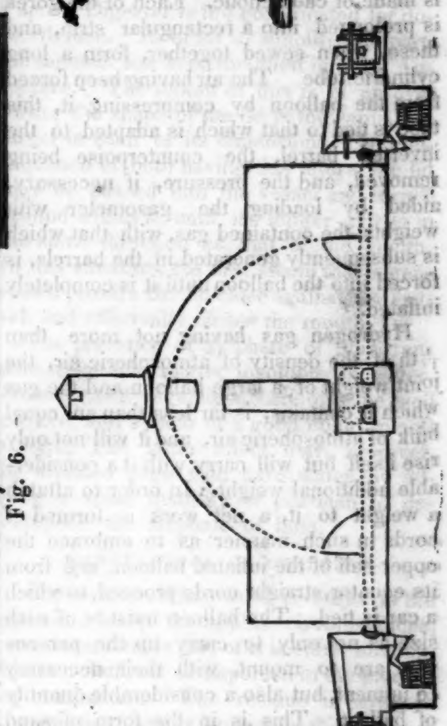


Fig. 2.









Applications of Chemistry to the Useful Arts, being the substance of a Course of Lectures delivered in Columbia College, New-York, by James Renwick, Professor of Natural Experimental Philosophy and Chemistry.

V.

APPLICATIONS OF HYDROGEN, CARBON, AND THEIR COMPOUDS.

1. AEROSTATION.

The only direct use to which gaseous hydrogen is put, is to the filling of balloons. The hydrogen for this purpose is prepared in the mode usually practised in chemical laboratories but on a larger scale. The substances employed are water, clean iron filings, and sulphuric acid. The apparatus is composed of a number of barrels which are arranged in the circumference of a circle. In each of these, iron filings is introduced to the depth of a few inches, and the barrel is then headed up. Through the head of each barrel a leaden pipe is introduced which reaches nearly to the bottom of the barrel and is formed into a funnel on the outside of the cask. This serves for the introduction of the water and sulphuric acid. Another leaden pipe is passed through the head of each barrel without

entering beneath its lower surface. These pipes serve to convey the gas generated in each barrel to a common reservoir, placed in the centre of the circle around which they are arranged. This reservoir is of the character of the chemical apparatus called a gasometer. It is formed of two large tubs, one of which is inverted within the other. The space between them, as well as the inner tub, is filled with water, the air being allowed to escape from the latter by a tube adapted to its head and furnished with a stop-cock. As soon as this tub is filled with water the stop-cock is closed.

The tubes which convey the gas are passed over the edge of the outer tub or through its staves, and their open ends pass beneath the cavity of the inner tub. The gas therefore enters it, and rising to the surface of the water tends to buoy it up, which action is aided by a counterpoise until the balloon is ready to receive it.

Balloons are bags of a spherical or sphersidal form, made of gores of silk, coated with a varnish which renders it imperrious to air. The best for this purpose is made of caoutchouc. Each of the gores is prolonged into a rectangular strip, and these, when sewed together, form a long cylindric tube. The air having been forced from the balloon by compressing it, this tube is tied to that which is adapted to the inverted barrel, the counterpoise being removed, and the pressure, if necessary, aided by loading the gasometer with weights, the contained gas, with that which is subsequently generated in the barrels, is forced into the balloon until it is completely inflated.

Hydrogen gas having not more than $\frac{1}{15}$th of the density of atmospheric air, the joint weight of a large balloon and the gas which it contains, is far less than an equal bulk of atmospheric air, and it will not only rise itself but will carry with it a considerable additional weight. In order to attatch a weight to it, a net work is formed of cords in such manner as to embrace the upper half of the inflated balloon, and from its equator, straight cords proceed, to which a car is tied. The balloon must be of such size as not only to carry up the persons who are to mount, with their necessary equipment, but also a considerable quantity of ballast. This is in the form of sand tied up in canvass bags. The object of this combined with a valve in the top of the balloon, is to enable the aeronaut to ascend or descend at pleasure as long as the ballast and the gas in the balloon are not wholly expended.

This valve is placed on the top of the balloon and is thus constructed: the gores, instead of meeting in a point, are united upon a ring of whalebone, and thus leave a circular opening; to this a circular shutter of silk, spread upon a similar ring, is adapted by a hinge; two cords proceed from this, over the net work, in opposite directions to the car; by one of these the valve can be opened, and by the other, closed.

Then the balloon is released by cutting cords which held it down, the tube which proceeds from its lower point, and is long enough to reach the car, is left open, in order that the gas in the balloon may be at liberty to escape as it tends to expand itself, in consequence of its reaching regions in the atmosphere less dense then those nearer the surface of the earth. Although the escape of this gas renders the balloon somewhat lighter, it must finally reach a position where its weight is exactly the same as that of an equal bulk of the surrounding air, and must cease to ascend. A farther height may be attained by throwing out ballast. This is done by opening the bags in which it is contained.

When it is wished to descend, the valve in the top of the balloon is opened until the collapse caused by the escape of the gas renders the balloon heavier than an equal bulk of the surrounding medium, and the force which causes the descent will be an increasing one, as the collapse is increased by the increasing pressure of the denser air. It may therefore be necessary to check it by the discharge of ballast, and by doing this in sufficient quantity, the balloon may be rendered stationary or caused to ascend again. In the latter case it is no longer necessary to allow the gas to escape by the tube beneath, which is therefore closed by knotting it.

A balloon has no other capacity of being directed except in ascent and descent. No power has yet been discovered, which can be called into action, of sufficient intensity to propel a balloon through the air, and make it move in a direction contrary to the currents of wind, and which shall be produced by apparatus sufficiently light to be carried up by a balloon.

USES AND PURIFICATION OF WATER.

Water as found in nature is never absolutely pure. Even when it contains no solid matter, either in solution or mechanically mixed, it is charged with gases. The most important of these are carbonic acid and oxygen. These however, so far from being injurious, are absolutely necessary to render water palatable, and probably increase its usefulness in the animal economy. Water which falls in cities where coal is used as a fuel, contains sulphurous acid gas in solution, which gives it a disagreeable taste. This may be readily separated by heating it to the boiling point; as,however,the othus gases will also be driven off, water ther purified must be exposed to the air for some time, in order that it may again absorb oxygen and carbonic acid. The water of rivers is often turbid, in consequence of their carrying with them earthy matter in a state of minute division, it may also contain animal and vegetable matter, or even living animalculæ. Such organic matter renders it unwholsome. The earthy and heavier organic matter may be separated by placing the water in tanks and reservoirs where it may remain at rest, and the clear fluid may be drawn off, but in this way living animals and lighter substances will still remain. It is therefore better to purify it by filtration. In order to deprive it of all disagreeable taste or smell, a part of the filter should be composed of charcoal. By long use, the charcoal will finally become so charged with the offensive matter that it will cease to act. The filter must then be opened and the charcoal replaced by another portion of the same substance, or the old charcoal purified by heat.

The same property of charcoal may be applied to the purification and preservation of water in ships. For the first purpose it is only necessary to mix thoroughly with the water in the casks a few ounces of powdered charcoal; for the latter the casks may be charred within. The purification of water from insoluble matter by filtering is performed by nature on a large scale within the crust of the earth, and that which issues from springs, and is found in wells is usually purified; but it may thus receive soluble impurities, although there are unquestionably some cases where the natural filter has the property of decomposing and retaining the soluble matter. Thus, on islands which are mere sandbeaches, fresh water may often be found by digging, which can have no other source than the neighboring water of the ocean, but this natural process has not been imitated by art.

The mere separation of insoluble matter from water has sometimes been effected on a large scale by taking advantage of natural circumstances. Thus at Glasgow, instead of pumping water from the River Clyde, tunnels of brick laid in sand are sunk in the gravelly bank of the river; through this water filters, and is drawn from the tunnels by a steam engine. At Toulouse, the reservoir which supplies the city is a basin dug in a gravelly bank, and separated from the river by a narrow dyke, through which the water passes perfectly clear. This reservoir has another valuable quality which we cannot avoid mentioning. The lower part of it is filled with large boulders, on these smaller water worn stones are laid; these are succeeded in turn by gravel, and the gravel by sand. The water which occupies the spaces between the stones is thus maintained throughout the year at an uniform temperature, and is neither affected by the frost of winter, or the scorching heats of summer. This temperature too, which is that of native springs, is such as causes the water to retain the greatest quantity of the gases which render it palatable.

Water which is conveyed great distances in pipes, or is precipitated in falls, loses these gases and will not regain them until exposed to the air. A remarkable instance of the last sort occurs at the Falls of Niagara, where the water above the fall is agreeable, and in the pool below as nauseous as that which has been boiled. The same action has even been applied to procure air separated from falling water, to be used in the manner of that forced from a bellows.

Water which comes from springs in the vicinity of the sea or its arms is often impregnated with marine salt. It is then said to be brackish, and for this no remedy has yet been propsed except the costly one of distellation. That from inland springs often holds in solution carbonate of lime by excess of acid, and sulphate of lime.

These give the water the character called *hard*, rendering it unfit for the solution of soap, for making vegetable extracts, and for being used in the arts of bleaching and dyeing. It is also less wholesome as a drink, and, except to persons whose taste has become vitiated, disagreeable.

Nature has provided a slow but sure remedy for this defect. On exposure to the air the excess of carbonic acid which holds the carbonate of lime in solution, is dissipated, and that earthy salt percipitated. If on the other hand sulphate of lime be contained in the water, the superior affinity of that earth for carbonic acid will cause it to attract that acid from the atmosphere, by which this insoluble carbonate will be formed. Thus the water of stagnant ponds, even in countries where calcareous matter abounds, may be well adapted to manufacturing purposes. Such water is however unwholesome, as it undergoes decomposition from the presence of putrescent vegetable matter. But when large rivers flow for a great extent, with a regular and steady course, these chemical changes take place without the corresponding inconvenience arising, and in addition by an action not yet explained, all animal and vegetable matter is rendered insolubie. For this reason the waters of the Nile, the Ganges, and the Mississippi have a well founded reputation for their delicious taste. Even the water of rivers which receive every species of offensive animal and vegetable matter, is, when filtered, almost perfectly pure.

We learn from this, that in supplying cities with water, the true plan is to bring it so far as possible in channels formed like a canal in the natural earth. Channels of masonry are of all the most to be avoided, as the water cannot fail to be contaminated with calcareous matter which will render it unfit for use in any of the chemical arts. The antients did not feel this objection to the use of aqueducts of masonry, partly because they had not reached that advance in the chemical arts, which now makes their practice almost a necessary of life, but more particularly from the very superior quality of their masonry, which was so accurately jointed as hardly to admit the edge of a knife. This perfectiou is not beyond the reach of modern art, but would involve an expense which would not be submitted to.

When water holds calcarous matter in solution, the lime combines with certain acids which exist in all soap, and form with that earth an insoluble compound, which is lighter than water and floats at its surface. The sulphate of lime, which is most frequent, may be decomposed by the salts of ammonia and hence the use of putrescent urine in the art of bleaching.

As this sulphate has the property of combining with vegetable matters and rendering them insoluble in water, water may be rendered soft by boiling in it for a long time some muculagincus vegetables. A more speedy method of rendering hard water soft is as follows:

To purify 100 gallons of water; dissolve six pounds of pearlash, or subcarbonate of soda in a gallon of soft water, boil the solution, when it boils add two ounces of soap cut into small pieces, and stir the boiling liquid until the whole of the soap is dissolved. When this solution is added to the water to be purified, the soap and sulphate of lime mutually decompose each other, the insoluble compound of the acids of the soap with the lime rises and coagulates at the surface, whence it may be skimmed off.

The sulphate of lime may be more slowly decomposed, by adding a small quantity of carbonate of soda or potash. The acid of this will finally convert the lime into carbonate, which will be precipitated when the excess of acid is expelled. The mode which immediately preceeds, is however, more certain and rapid, and will fit the water for every use in the arts. This is the mode which was referred to in speaking of the bleaching of wool as capable of superceding the offensive matter which is now in use.

Water is most extensively used in preparation of our food, and the proper application of it to this purpose is by no means so simple as it might at first appear. The fibrous flesh of animals is made up of two distinct substances, albumen and gelatine. The former is insoluble in water, and coagulates at the temperature of boiling; the latter is slowly soluble in cold, and more rapidly in boiling water, by which it is previously softened. Albumem exists nearly pure in the white of an egg, gelatine when separated from other matter becomes glue.

When meat is to be cooked by boiling, if it be suddenly exposed to the boiling temperature, the albumen coagulates, and forming a hard coat, protects the gelatine from the action of the water, and although by long continued boiling the latter may be dissolved, the meat will remain in the form of tough stringy fibres. But if it be slowly raised to the boiling heat, the albumen retains its viscid liquid form until the gelatine is softened and partially dissolved; part of the former also separates and rises to the surface of the fluid whence it may be skimmed off.

It is the solution of the gelatine in water, with a part of the liquid matter of the meat which forms the broth which is the basis of soup.

It will be easily seen from what has been stated, that sudden heat and rapid boiling will render the meat tough, or if continued until it be tender, stringy and tasteless. On the other hand, if gradually heated to the boiling temperature without being ever permitted to boil rapidly, the broth will be more readily charged with gelatine, the meat will be tender and full of its original juices.

It is to the proper application of these principles that the great superiority of French over the English and American cookery is mainly to be attributed, for the broth is not only used by the French in the form of soup but is the vehicle of all their sauces, and the meat whence the soup is prepared, instead of being useless as with us, is the most important of their dishes.

The fat of animals is rendered soluble in water by vegetable matters, and this furnishes an important addition to the means of preparing food. Vegetables fried in butter or fat, and boiled in water, furnish a nourishing and palatable liquid, the *soupe maigre* of Catholic countries. The bones of animals contain large quantities of gelatine, but this is so intimately mixed with an insoluble substance (the phosphate of lime,) that it cannot be separated, except from the mere surface, by water at the ordinary temperature of boiling. Water, however, heated in close vessels to a higher temperature, acquires the power of separating gelatine even from bones. For this purpose, an instrument was invented about 150 years since, by Papin, and called by him the digester. It is a strong vessel of copper, to the mouth of which a circular lid is close fitted by grinding. The vessel stands in in an iron frame having four feet. To the top of these feet a cross of iron, which rests upon the lid, is fastened by screws, and thus the lid is prevented from rising when the first steam is generated within. To complete the arrangement, a safety valve is provided, by the weight of which the pressure of the steam within, and consequent temperature of the water is regulated.

The arrangement for closing the lid of Papin's Digester is too complicated for domestic use. In order to simplify this part, the digester has been modified into the Autoclave. The mouth of this is of an oval form; the shape of the lid is the same, but larger in each of its dimensions. In consequence of both having this figure, the lid may be passed into the vessel and turned around within it, until its longer axis is in the same direction as that of the mouth. In this situation, the first steam that is generated presses the lid close against the vessel, and effectually closes the mouth.

The presence of sulphate of lime renders vegetable matter insoluble in water. Hence green vegetables can only be well cooked, and appear of a good color, in soft water. The latter effect may, however, be attained even with hard water, by adding a small quantity of pearlash to decompose the sulphate of lime.

MANUFACTURE OF CHARCOAL.

Rationale.—When wood is burnt in the open air, under favourable circumstances, as a considerable part of it is either inflamable or volatile, it is dispersed in the process of combustion. The residue is earthy in appearance, and is known by the name of ashes. The quantity of ashes given by different woods, and by different parts of the same tree, vary very materially. Thus the wood of the linden yields eight times as much ashes as the wood of the pine, and bark from 15 to 30 times as much as the wood within. The linden seems to yield the largest quantity of ashes, which is as much as much as five per cent; oak yields about 2½ per cent; and pine eight tenths per cent. The character of these ashes varies in different kinds of wood, but the substances which are almost always found, are the cabonate of lime and magnesia; phosphate of lime; chloride of potassium, and the sulphate and carbonate of potassa; and silicia, either pure or combined with potassa and lime.

By distillation and heat in close vessels,

and condensing the volatile parts, the whole of the matter of the wood may be collected. This is now found to consist of a black mass, retaining the figure and structure of the wood, and known by the name of charcoal, composed of carbon, and the earthy and saline matter mentioned as found in ashes; water; acetic acid held in the water; tar, partly unmixed, and parly dissolved in the water by the action of the acetic acid; with carbonated hodrogen, carbonic oxide and carbonic acid. At the temperature of 340° Fahr. the quantity of solid matter left is nearly double that left at a red heat, and if exposed suddenly to a heat above redness, the quantity of charcoal left, is diminished. The charcoal is itself a product of sufficient value to be sought for to the exclusion of the rest; at other times the decomposition of wood is effected principally for the sake of the acetic acid; the carbonated hydrogen has in some few cases been collected and applied to the purpose of illumination, and when this is the case the tar is also saved.

Manufacture.—The most perfect mode of manufacturing charcoal, is that which corresponds most nearly with the distillation referred to in the preceding section. Wood is introduced into iron cylinders, which are closed, and placed in a heated furnace.—The action is continued as long as any gaseous or volatile matter appears. The cylinder is then removed, and replaced by another also charged with wood. As the gas which is evolved is principally of an inflamable character, it is, after the condensable substances have been separated in a proper refrigerator, carried by a pipe to the furnace, where it is inflamed by the burning fuel, and by the heat of its combusiion, aids in the distillation of the remainder of the wood. This method is employed in the manufacture of charcoal for gunpowder.—In this process, it has been found that dry wood yields 28 per cent. of charcoal, and requires 12½ per cent. of the same wood, used as fuel, to effect its decomposition.

That part of the volatile matter which consists of water holding acetic acid, and tar in solution, goes by the name of pyroligneous acid. This process is sometimes conducted principally in reference to this product, which may be used in the preparation of vinegar, and as a source of pure acetic acid.

The apparatus used in this method is too costly to permit it to be employed in making the great quantities of charcoal which are required in various chemical and mechanical arts, and for domestic purposes. In these cases, recourse is had to the simple and ancient mode of carbonising the wood, in what are usually styled *coal-pits*.

The wood which is to be converted into charcoal, is cut to the usual length of cord wood, say about four feet. A floor is first formed by laying logs radiating from a centre, with an interval of a few inches between them, and filling the sectors of the circle included between them with other logs. At the centre of this circle, a stake is set up vertically, to the top of which two short pieces, crossing each other, are adjusted. Four logs are placed on end, leaning against the stake and supported by the cross. Around these, other logs are placed leaning against them, thus forming a truncated cone resting on the horizontal layer. If the quantity of wood permit, a second and a third range of logs are piled up in the same manner; the rule to be observed, being that the height of the truncated cone shall be about half the diameter of the base. The heap being completed, the outside is covered with small wood, on which are laid twigs and branches. Upon these, a layer of earth, from 4 to 6 inches thick, is placed, covering the whole heap, except a few openings, one of which is in the middle of the top, and others correspond to the radiating passages in the horizontal layer.

The pit being thus finished, it may be set on fire either by pushing burning brands to the centre of the base through one of the horizontal passages; or by drawing out the central stake of the upper layer, and dropping in burning fuel.

A thick smoke will first ooze through the hole at the top of the heap, which will be followed, after a time, by flame. As soon as flame appears, this hole is closed by laying a sod over it. It now becomes necessary to pay particular attention to the regulation of the combustion, by closing and opening the remaining holes, in proportion to the energy of the combustion. If it be too rapid, too large a portion of the charcoal will be consumed; if too slow, the logs will be only partially charred, leaving what are called brands. In addition to the holes already left, it may be neeessary to open others at points where the combustion is too slow, and to stop up crevices which may be formed by the cracking of the earthen covering. A regular and proper action is marked by smoke flowing slowly and in equal quantity from all the openings but that at the top, where the greater rapidity of the current causes a larger quantity of smoke to make its way from under the sod laid upon it. When the outer logs of the pile have been reached by the fire, which will be shown by the outside appearing of a dull red heat at night, the process is completed; all the openings must then be carefully stopped, and a second layer of earth applied to the whole surface. After a few hours, these coats of earth are removed, and replaced by a third, which must be so applied as to prevent all access of external air.

In a pit of a single layer, the whole process is finished on the fourth day, and the charcoal fit to be drawn. In the largest heaps, it may not be finished for from 15 to 30 days.

This process would be perfect, were no more wood burnt away than is sufficient to drive off the volatile matter of the remainder. It is, however, hardly possible to attain this, although it is said to have been approached in Sweden, in some instances, when the heaps were of the largest size. In this operation, even when performed under favorable circumstances, it rarely happens that 112½ lbs. of wood yield more than 17 of charcoal, while by distillation in a cylinder, the same quantity, as we have seen, yields 28 lbs. It is also impossible, in this method, to collect the pyroligneous acid or gas.

The waste which thus takes place, has led to various attempts to improve the process. Among these, has been the formation of moveable enclosures of basket-work, by which the pits might be surrounded, and which, if carefully guarded from combustion during the first time they are used, are so much charged with pyroligneous acid as to be thereafter almost incombustible. Another method is, to form the floor of the pit of iron sheets, or cast iron plates, beneath which is a cavity that serves as a furnace; no air holes need be left in this method, and thus little wood is burnt away. It has been proposed, by Mr. Marcus Bull, to effect the conversion into charcoal, at the expense of fuel of inferior value; for this purpose, the whole space between the logs is filled up with the refuse charcoal of former burnings, which, being more inflammable than wood, burns first, and chars the logs.

By either of these methods, the product of 112½ lbs. of wood may be raised to 22 lbs. The last is obviously easily practicable; as wherever the preparation of charcoal is carried to a large extent, the removal and handling leaves a considerable quantity of dust and small fragments which may be applied to the purpose.

At the Bennington furnace, (Vermont,) where the coal is obtained from a tract of wood land which has never before been cut, a mode of preparing charcoal, different from any we have described, has been put in practice. The trees were of so large a size, as to render the labor of cutting them in lengths, and piling them on end, excessive. They, in consequence, were not reduced to less dimensions than 12 feet in length, and were rolled together into piles in which they retained their horizontal position, and which, therefore, had a prismatic form. These heaps were covered with earth, and lighted from the top; the draught vents were at the ends. The management, in other respects, was the same as in the conical pits, and the charcoal was of superior quality.

(Concluded in the next.)

AGRICULTURE, &c.

From the New England Farmer.

FARMERS' WORK.

Roots for Cattle.—It is impossible to manage a farm to advantage, or raise stock to profit without feeding cattle with roots; and among the best of roots for that purpose is the ruta baga, or Swedish turnip. We believe that the person most instrumental in introducing the culture of that excellent root into the U. S. was the late William Cobbett. The following directions for raising that root are extracted from a treaties written by that famous agriculturist; and perhaps are as as plain and correct as can be prescribed.

Mode of saving aud preserving the seed.—The ruta baga is apt to degenerate if the seed is not sowed with care. In England we select the fairest roots and the best form for seed, rejecting all such as are of a whit-

ish color or greenish towards the neck, preferring such as are of a *redish cast.* These when selected should be carefully preserved over the winter, and set in the month of March or April, in a rich soil, remote from any roots of the turnip or cabbage kind, to preserve the seed pure and unmixed. Two or three roots if they do well, will yield seed sufficient for an acre of land. Let the seed remain in pods until the time of sowing.

Time of sowing.—The time of sowing may be from the 25th of June to the 16th of July, as circumstances may be.

Quality and preparation of the land.—As a fine, rich garden mould of great depth and having a porous substratum is best for every thing that vegetates except plants that live best in water, so it is best with ruta baga. I know of no soil in the United States, upon which this root may not be cultivated with the greatest facility, excepting a *pure sand* and a *stiff clay*, which are very rare in this country.

Manner of sowing.—My ploughman puts the ground up in little ridges, having two furrows on each side of the ridge, so that each ridge consists of four furrows, and the tops of the ridges were about four feet from each other; and as the ploughing was performed to a great depth, there was of course a very deep gutter between every two ridges.

I took care to have the manure placed so as to be under the middle of each ridge, that is to say, just beneath where my seed was to come, which was sown principally in this manner:—A man went along by the sides of each ridge, and put down two or three seeds in places ten or twelve inches distance from each other, just drawing a little earth over and pressing it lightly upon the seed, in order to make it vegetate quickly, before the earth became too dry. In this method four pounds of seed sowed seven acres. Two men sowed the whole seven acres in two days.

After culture.—When the plants were fairly up, we went with a small hoe, and took out all but one in each ten or twelve inches, and thus left them to stand single. We next went with a hoe, and hoed the tops of the ridges about six inches wide on each side of the rows of plants, and then horse hoed between the rows, with a common horse plough, after the manner of tilling Indian corn, or potatoes, by first turning the earth from the plants, and next towards the plants at the second hoeing. There is no ground lost in these wide intervals, for the lateral roots of the large turnip, as well as the ruta baga will extend six feet from the ball of the plant; and my crop of thirty three tons, or thirteen hundred and twenty bushels to the acre, taking the whole field together, had the same intervals; and less than this, as was practiced by my neighbors, always diminished the crop. Wide as the intervals were, the leaves of some of the plants would nearly meet across the rows, and I have had them frequently meet in England.

From the May No. of the New-York Farmer.

Cashmere Goats.—We were invited, a few days since, by Mr. J. Donaldson Kinnear, of Albany, to view a Cashmere Goat. Mr. Kinnear, through the aid of relatives in France, purchased a pair of these beautiful and rare animals, from a gentleman who owns the only flock in France; and they were brought from Paris to Havre in the Diligence, and there put on board of one of the packets, but from some cause, the voyage was too much for the buck, which died, as well as the young kid, which was added to the family on the voyage. The doe, however, survived; and although very lean, is a beautiful animal; being, as we were informed, the *first ever imported into this country*, will, we hope, be the first of *numerous flocks* which shall in a few years cover our hills; and we trust that Mr. Kinnear may soon replace his loss, and be successful, in rearing a flock which may be profitable. Why may we not, in a few years, manufacture Cashmere shawls, as well as silk? We MAY—and shall do it—and compete with the foreign manufacture in this as in every thing else we undertake.

NOTICE TO CONTRACTORS.

JAMES RIVER AND KANAWHA CANAL.

PROPOSALS will be received at the Office of the James River and Kanawha Company, in the City of Richmond, from the 15th to the 23rd day of August, for the construction of all the Excavation, Embankment and Walling not now under contract, together with nearly all the Culverts and the greater portion of the Locks between Lynchburg and Maidens' Adventure.

The work now advertised embraces the twenty miles between Columbia and the head of Maidens' Adventure Pond, the eight miles between Seven Island Falls and Scottsville, and about twenty isolated sections, reserved at the former letting, between Scottsville and Lynchburg.

The quantity of masonry offered is very great—consisting of about two hundred Culverts of from three to thirty feet span; nine Aqueducts, thirty-five Locks a number of Wastes, with several farm and road Bridges.

General plans and specifications of all the work, and special plans of the most important Culverts and Aqueducts, will be found at the offices of the several Principal Assistant Engineers on the line of the Canal.

The work will be prepared for examination by the 25th July; but mechanics, well recommended, desirous of immediate employment, can obtain contracts for the construction of a number of Culverts at private letting.

Persons offering to contract, who are unknown to the subscriber, or any of the Assistant Engineers, will be expected to accompany their proposals by the usual certificates of character and ability.

CHARLES ELLET, Jr.,
Chief Engineer of the James River and Kanawha Company

NOTE.—The Dams, Guard-Locks, most of the Bridges, and a number of Locks and Culverts, are reserved for a future letting. Persons visiting the line for the purpose of obtaining work, would do well to call at the office of the Company in the city of Richmond, where any information which they may desire will be cheerfully communicated.

The valley of James River, between Lynchburg and Richmond, is healthy. (20—ta18) C. E. Jr.

RAILWAY IRON.

95 tons of	1 inch	by ½ inch.			FLAT BARS in lengths of 14 to 15 feet, counter sunk holes, ends cut at an angle of 45 degrees, with splicing plates and nails to suit.
200	do	1¼	do	½ do	
40	do	1¼	do	⅜ do	
800	do	2	do	½ do	
800	do	2½	do	½ do	
soon expected.					

250 do. of Edge Rails of 36 lbs. per yard, with the requisite chairs, keys, and pins.

Wrought Iron Rims of 30, 33, and 36 inches diameter for Wheels of Railway Cars, and of 60 inches diameter for Locomotive Wheels.

Axles of 2½, 2¾, 2⅞, 3, 3¼, 3½, and 3¾ inches in diameter, for Railway Cars and Locomotives, of patent iron.

The above will be sold free of duty, to State Governments and Incorporated Governments, and the drawback taken in part payment.

A. & G. RALSTON,
9 South Front street, Philadelphia.

Models and samples of all the different kinds of Rails, Chairs, Pins, Wedges, Spikes, and Splicing Plates, in use both in this country and Great Britain, will be exhibited to those disposed to examine them.

4—d7 1meowr

RAILROAD CAR WHEELS AND BOXES, AND OTHER RAILROAD CASTINGS.

Also, AXLES furnished and fitted to wheels complete at the Jefferson Cotton and Wool Machine Factory and Foundry, Paterson, N. J. All orders addressed to the subscribers at Paterson, or 60 Wall street, New-York, will be promptly attended to.

Also, CAR SPRINGS.

Also, Flange Tires, turned complete.

18 ROGERS, KETCHUM & GROSVENOR.

STEPHENSON,

Builder of a superior style of Passenger Cars for Railroads.

No. 264 Elizabeth street, near Bleecker street, New-York.

RAILROAD COMPANIES would do well to examine these Cars; a specimen of which may be seen on that part of the New-York and Harlaem Railroad now in operation J25tf

ALBANY EAGLE AIR FURNACE AND MACHINE SHOP.

WILLIAM V. MANY manufactures to order IRON CASTINGS for Gearing Mills and Factories of every description.

ALSO—Steam Engines and Railroad Castings of every description.

The collection of Patterns for Machinery, is not equalled in the United States. 9—1y

FRAME BRIDGES.

THE subscriber would respectfully inform the public, and particularly Railroad and Bridge Corporations that he will build Frame Bridges, or vend the right to others to build, on Col. Long's Patent, throughout the United States, with few exceptions. The following sub-Agents have been engaged by the undersigned who will also attend to this business, viz.

Horace Childs,	Henniker, N. H.
Alexander McArthur,	Mount Morris, N. Y.
John Mahan,	do do
Thomas H. Cushing,	Dover, N. H.
Ira Blake,	Wakefield, N. H.
Amos Whitmore, Esq.,	Hancock, N. H.
Samuel Herrick,	Springfield, Vermont.
Simeon Herrick,	do do
Capt. Isaac Damon,	Northampton, Mass.
Lyman Kingsly,	do do
Elijah Halbert,	Waterloo, N. Y.
Joseph Hebard,	Dunkirk, N. Y.
Col. Sherman Peck,	Hudson, Ohio.
Andrew E. Turnbull,	Lower Sandusky, Ohio.
William J. Turnbull,	do do
Sabried Dodge, Esq.,	(Civil Engineer,) Ohio.
Booz M. Atherton, Esq.	New-Philadelphia, Ohio.
Stephen Daniels,	Marietta, Ohio
John Rodgers,	Louisville, Kentucky.
John Tillson,	St. Francisville, Lous'a.
Capt. John Bottom,	Tonawanda, Penn
Nehemiah Osborn,	Rochester, N. Y.

Bridges on the above plan are to be seen at the following localities, viz. On the main road leading from Baltimore to Washington, two miles from the former place. Across the Metawamkeag river on the Military road, in Maine. On the National road in Illinois, at sundry points. On the Baltimore and Susquehanna Railroad at three points. On the Hudson and Patterson Railroad, in two places. On the Boston and Worcester Railroad, at several points. On the Boston and Providence Railroad, at sundry points. Across the Contoocook river at Hancock, N. H. Across the Connecticut river at Haverhill, N. H. Across the Contoocook river, at Henniker, N. H. Across the Souhegan river, at Milford, N. H. Across the Kennebec river, at Waterville, in the state of Maine — Across the Genesse river, at Mount Morris, New-York, and several other bridges are now in progress.

The undersigned is about to fix his residence in Rochester, Monroe county, New-York, where he will promptly attend to orders in this line of business to any practicable extent in the United States, Maryland excepted. MOSES LONG.

General Agent of Col. S. H Long.

Rochester, May 22d, 1836. 19y-tf.

PATENT RAILROAD, SHIP AND BOAT SPIKES.

☞ The Troy Iron and Nail Factory keeps constantly for sale a very extensive assortment of Wrought Spikes and Nails, from 3 to 10 inches, manufactured by the subscriber's Patent Machinery, which after five years successful operation, and now almost universal use in the United States, (as well as England, where the subscriber obtained a patent,) are found superior to any ever offered in market.

Railroad Companies may be supplied with Spikes having countersink heads suitable to the holes in iron rails, to any amount and on short notice. Almost all the Railroads now in progress in the United States are fastened with Spikes made at the above named factory—for which purpose they are found invaluable, as their adhesion is more than double any common spikes made by the hammer.

*** All orders directed to the Agent, Troy, N. Y., will be punctually attended to.

HENRY BURDEN, Agent.

Troy, N. Y., July, 1831.

*** Spikes are kept for sale, at factory prices, by I. & J. Townsend, Albany, and the principal Iron Merchants in Albany and Troy; J. I. Brower, 222 Water street, New-York; A. M. Jones, Philadelphia; T. Janviers, Baltimore; Degrand & Smith, Boston.

P. S.—Railroad Companies would do well to forward their orders as early as practicable, as the subscriber is desirous of extending the manufacturing so as to keep pace with the daily increasing demand for his Spikes. (1J23am) H. BURDEN.

AMES' CELEBRATED SHOVELS, SPADES, &c.

300 dozens	Ames'	superior back-strap Shovels	
150 do	do	do plain	do
150 do	do	do caststeel Shovels & Spades	
150 do	do	Gold-mining Shovels	
100 do	do	plated Spades	
50 do	do	socket Shovels and Spades.	

Together with Pick Axes, Churn Drills and Crow Bars (steel pointed,) manufactured from Salisbury refined iron—for sale by the manufacturing agents,

WITHERELL, AMES & CO.
No. 2 Liberty street, New-York
BACKUS, AMES & CO.
No. 8 State street, Albany

N. B.—Also furnished to order, Shapes of every description, made from Salisbury refined Iron. 4—ytf

MILL-DAM FOUNDRY.

TO BE SOLD OR LEASED the above well known establishment, situated one mile from Boston. The improvements consist of,

No. 1. *Boiler House*, 50 feet by 30 feet, containing all the necessary machinery for making boilers for *Locomotive* and other steam Engines.

No. 2. *Blacksmith's Shop*, 50 feet by 20, fitted with cranes for heavy work.

No. 3. *Locomtive House*, 54 feet by 25, used for putting together Locomotive Engines. Several of the best Engines in use in the United States have been put in this establishment.

No. 4. A three story brick building, covered with slate, 120 feet by 46, containing two water-wheels, equal to 40 horse power; Machine Shop, filled with lathes, &c.; Pattern Shop; Rolling Mill and Furnaces, capable of rolling 4 tons of iron per diem, exclusive of other work; three Trip Hammers, one of which is very large; engine for blowing Cupola Furnaces, moved by water-wheel; one very superior 12 horse Steam Engine, which could be dispensed with; and a variety of other machinery.

No. 5. An Iron Foundry, 80 feet by 45, with a superior air Furnace, and two Cupolas, Core oven, Cranes, &c. fitted for the largest work. Attached to the Foundry is a large ware-house, containing Patterns for the Castings of Hydraulic Presses, Locomotive and other Steam Engines, Lead Mill Rolls, Geering, Shafts, Stoves, Grates, &c. These were made of the most durable materials, under the direction of a very scientific and practical Engineer, and are supposed to be of great value.

No. 6. A building, 65 feet by 36, containing a large stack of chimneys, and furnaces, for making Cast Steel. This building has been used as a boarding-house, and can accommodate a large number of men.

No. 7. A range of buildings, 200 feet long by 30, containing counting room, several store rooms, a Brass Foundry, room for cleaning castings, a large loft for storing patterns, stable for two horses, &c. &c.

The above establishment being on tide water, presents greater advantages for some kinds of business than any other in the United States. Coal and Iron can be carried from vessels in the harbors of Boston, to the wharf in front of the Factory, at 25 to 30 cents per ton. Some of the largest jobs of iron work have been completed at this establishment; among others, the great chain and lift pumps for freeing the Dry Dock at the Navy Yard, Charleston.

The situation for Railroad work is excellent, being in the angle formed by the crossing of the Providence and Worcester Railroads. The Locomotive "Yankee," now running on the latter road, and the "Boston," purchased by the State of Pennsylvania, were built at these works. With the Patterns and Machinery now on the premises, 20 Locomotives, and as many tenders, besides a great quantity of cars and wagons, could be made per annum.

For terms, apply to
THOS. J. ECKLEY, Boston,
or to ROBERT RALSTON, Jr. Phila.

Boston, April 21, 1835. j25—4t

☞ THE NEWCASTLE MANUFACTURING COMPANY, incorporated by the State of Delaware, with a capital of 200,000 dollars, are prepared to execute in the first style and on liberal terms, at their extensive Finishing Shops and Foundries for Brass and Iron, situated in the town of Newcastle, Delaware, all orders for LOCOMOTIVE and other Steam Engines, and for CASTINGS of every description in Brass or Iron RAILROAD WORK of all kinds finished in the best manner, and at the shortest notice.

Orders to be addressed to
MR. EDWARD A. G. YOUNG,
feb 20—ytf Superintendent, Newcastle, Del.